Clinical Guideline

CHILDHOOD HEAD INJURY: ASSESSMENT AND MANAGEMENT

SETTING
Bristol Royal Hospital for Children (BRHC), Emergency Department (CED).

FOR STAFF
All staff assessing children presenting to the CED with a head injury.

PATIENTS
Children presenting to the CED with moderate, mild or minimal head injury.

General

Please see Appendix 2 for the assessment and management flowchart.

Head injury is the most common childhood injury reason when attending Emergency Departments (EDs).

A large number are minimal (or trivial) in severity with no underlying traumatic brain injury (TBI).

This guideline differentiates children who may be immediately discharged after ED assessment from those who require further investigation to identify TBI, which may or may not require neurosurgical intervention or intensive care.

Note 1: This guideline does not cover the management of severe head injury, major trauma, or children transferred from other hospitals for specialist input (for example from major trauma, neurosurgery, or intensive care services).

Note 2: Even the best performing clinical decision rules will not detect every case of traumatic brain injury – sometimes clinician judgment is the most important factor, so be suspicious, and have a low threshold for discussing cases with senior colleagues.

Grading Severity

Minimal head injury: low mechanism injury (eg ground level falls or walking/running into stationary objects), with no signs or symptoms of head injury other than scalp abrasions and lacerations.

Mild head injury: features include witnessed loss of consciousness, definite amnesia, witnessed disorientation/confusion, or vomiting in a patient with a Glasgow Coma Score (GCS) of 13-15.

Moderate head injury: features of intracranial injury, with GCS of 9-12 at any point.

Assessing Head Injury

A modified GCS should be used for children – please see Appendix 1.

Sleeping children need to be woken up fully before assessing GCS.

When assessing mechanism of injury, dangerous mechanisms include:

- High-speed road traffic accident either as pedestrian, cyclist or vehicle occupant.
- Fall from a height of greater than three metres.
• High-speed injury from a projectile or an object.

**Basilar skull fracture**: features include haemotympanum, blood from the external auditory meatus, ‘panda’ eyes, cerebrospinal fluid leakage from the ear or nose, Battle’s sign.

**Pre-verbal children**: several features, including amnesia and reporting of headache, will not be possible to assess in pre-verbal or young children. In these children features such as irritability, or behaviour out of keeping with normal, may be valuable clues.

**Symptoms and signs of intracranial injury**: GCS <15, drowsiness, lethargy, irritability, headache, vomiting, behavioural change, lateralising neurology (including false lateralising signs).

**Observing Head Injury**

Patients may be observed in the CED or the Observation ward (Ward 39) depending on their likely clinical course and degree of clinical concern.

This includes patients who present to the CED directly, or patients transferred from other hospitals/minor injury units for ongoing observation.

**Neurological observations** should be performed and recorded half-hourly until GCS is 15.

All head injured children (except those with minimal head injury) should have a blood pressure recorded.

The minimum frequency of observations for patients with GCS 15 is:

- Half-hourly for two hours.
- Then hourly for four hours.
- Then two-hourly thereafter.

Any of the following examples of neurological deterioration should prompt urgent clinical review with a view to an immediate CT (computed tomography) scan:

- Development of agitation or abnormal behaviour.
- Sustained (at least 30 minutes) drop of one GCS point.
  - Greater weight should be given to a drop in the motor score.
- Any drop of three or more points in the eye or verbal components of the GCS.
- Any drop of two or more points in the motor score.
- Development of severe or increasing headache.
- Persisting vomiting.
- New/evolving neurological signs, such as pupil inequality or asymmetry of limb/facial movement.

The maximum stay for observation on the observation ward is one night. If symptoms persist beyond this point the patient should be discussed with neurosurgery, and referred for inpatient care if necessary.

**Imaging**

**CT scanning** is the gold standard for imaging acute traumatic brain injury.
**Skull x-rays** are not ordered except:

- When non-accidental injury is suspected and it is ordered as part of a skeletal survey.
- In conjunction with high-quality inpatient observation where CT scan is not available.

The role for **ultrasound** in the assessment of head injury (i.e. identification of skull fracture) is unclear, and is not routinely used in the CED. However there may be a role for ultrasound to detect fractures in well patients with delayed presentation – this should only be done after discussion with the CED consultant.

**Magnetic Resonance Imaging (MRI)** may be preferable to CT in situations where symptoms persist beyond the acute phase – however, this should only be done after discussion with the CED consultant and Paediatric Neuroradiologist.

If you think a CT may be required, the case should be discussed immediately with the senior CED clinician prior to discussion with a radiologist if clinically indicated:

- In office hours, Paediatric Neuroradiology should be contacted via the radiology department.
- Out of hours, the Radiology registrar should be contacted via switchboard.

The CT should take place within one hour of the scan being requested.

A provisional written report should be available within one hour of the CT being performed.

**Sedation** is rarely required for CT imaging in our department. If sedation is required this should be discussed with the senior CED clinician +/- Anaesthetics.

**Neurosurgical Referral**

**Neurosurgical referrals** should be made to the Neurosurgical registrar via switchboard who will advise whether internal pager or radiopager is the best means of contacting.

Early discussion with neurosurgery where clinical suspicion of intracranial injury is high allows more rapid review of imaging and planning of any interventions.

Neurosurgical referral should be made in the presence of any abnormality on CT.

Neurosurgical referral should be considered if symptoms persist, even if the CT scan is normal.

**If admitting under neurosurgery** – decisions on further imaging and other management strategies should be made collaboratively with the neurosurgical team, regardless of admission location.

**Children with Bleeding Tendencies**

Bleeding tendencies may result from congenital or acquired defects, or due to medications. The evidence base regarding the role of imaging head injury in these children is weak.

Medications commonly in use include anticoagulants and antiplatelet drugs.

NICE guidance only refers specifically to warfarin; however care should be taken in all such cases as it is likely that other medications have risks at least equal to those of warfarin therapy.
All patients with potential bleeding tendency should be discussed with the senior CED clinician.

All patients with potential bleeding tendency should undergo a prolonged period of observation, regardless of CT scan result.

The threshold for performing CT scan in these patients should be lower than in the general population.

**Discharge**

Children who do not require a CT scan, or who have a normal CT scan and are asymptomatic, may be discharged after a suitable period of neurological observation providing:

- They have no significant extra-cranial injuries or persisting signs of intracranial injury.
- They wake and are alert easily, with a normal neurological examination.
- There is no suspicion of abuse or neglect.
- They live relatively close to hospital, with reliable caretakers who can return if necessary.

All carers of discharged patients need to have specific discharge instructions explained to them in verbal and written form with a “Head Injury advice sheet”.

Advice given on discharge should include information for parents on signs of potential acute deterioration within the first 48 hours (i.e. “red flag” symptoms which may indicate the need for imaging or neurosurgical intervention), and on potential problems which may persist or evolve over the medium to long term.

Patients and parents should be specifically asked about participation in contact sports, and be given advice on graded return to activities.

<table>
<thead>
<tr>
<th>RELATED DOCUMENTS AND PAGES</th>
<th>This guidance has been adapted from NICE CG 176 (2014) available at: <a href="http://www.nice.org.uk">www.nice.org.uk</a>. Please note – other related documents include any transfer policy for head injury for the PMT network, and the management of severe head injury CPG.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTHORISING BODY</td>
<td>Children’s Emergency Department Governance.</td>
</tr>
<tr>
<td>SAFETY</td>
<td>None.</td>
</tr>
<tr>
<td>QUERIES AND CONTACT</td>
<td>Contact Ext 28666 and speak to the CED senior medic on duty.</td>
</tr>
</tbody>
</table>
## Appendix 1 - Modified Glasgow Coma Scale for Infants and Children

<table>
<thead>
<tr>
<th>Area Assessed</th>
<th>Infants</th>
<th>Children</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye opening</td>
<td>Open spontaneously</td>
<td>Open spontaneously</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Open in response to verbal stimuli</td>
<td>Open in response to verbal stimuli</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Open in response to pain only</td>
<td>Open in response to pain only</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>No response</td>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td>Verbal response</td>
<td>Coos and babbles</td>
<td>Oriented, appropriate</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Irritable cries</td>
<td>Confused</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Cries in response to pain</td>
<td>Inappropriate words</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Moans in response to pain</td>
<td>Incomprehensible words or nonspecific sounds</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>No response</td>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td>Motor response*</td>
<td>Moves spontaneously and purposefully</td>
<td>Obeys commands</td>
<td>6</td>
</tr>
<tr>
<td><em>(If the patient is intubated, unconscious, or preverbal, the most important part of this scale is motor response. This section should be carefully evaluated.)</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Withdraws to touch</td>
<td>Localizes painful stimulus</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Withdraws in response to pain</td>
<td>Withdraws in response to pain</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Responds to pain with decorticate posturing (abnormal flexion)</td>
<td>Responds to pain with decorticate posturing (abnormal flexion)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Responds to pain with decerebrate posturing (abnormal extension)</td>
<td>Responds to pain with decerebrate posturing (abnormal extension)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>No response</td>
<td>No response</td>
<td>1</td>
</tr>
</tbody>
</table>
Appendix 2 – Childhood Head Injury Assessment and Management Flowchart

Are any of the following present?
- Major trauma/severe head injury.
- Intracranial shunt.
- Pre-existing neurological disorder.
- Under influence of drugs/alcohol.
- Attendance >24 hours after head injury.

Yes

Exit algorithm, use individualised management plan.
Discuss with senior CED medic and maintain high index of suspicion.

No

Assess severity of head injury.

Yes

Minimal

Discharge home with written and verbal head injury advice.

No

Mild

Are any of the following risk factors present?
- Suspicion of non-accidental injury.
- Post-traumatic seizure (no history of epilepsy).
- GCS <14 on initial assessment in ED.
- GCS >15 at 2 hours after the injury.
- Suspected open/depressed skull fracture.
- Tense fontanelle.
- Any sign of basal skull fracture.
- Focal neurological deficit.

Yes

For children under 1 year:
- Bruise/laceration/swelling >5cm on head.
- GCS <15 on initial assessment in ED.

Yes, >1

Discuss with senior ED doctor.
Perform CT within 1 hour of risk factor being identified.
Discuss with radiologist and complete ICE (Integrated Clinical Environment) request.
Consider need for sedation/GA (general anaesthetic).
A provisional written radiology report should be available within 1 hour of the CT scan.

No

Are any of the following present?
- Witnessed loss of consciousness >5 minutes.
- Abnormal drowsiness.
- 3 or more discrete episodes of vomiting.
- Dangerous mechanism of injury.
- Amnesia.

Yes, only 1

Observe for ≥ 4 hours post head injury. During observation, occurrence of:
- GCS <15.
- Further vomiting.
- Further episodes of abnormal drowsiness.

Yes

Discuss with senior CED medic.
For patients on warfarin perform CT within 8 hours of injury. A provisional written report should be available within 1 hour of the CT scan.

No

Current warfarin treatment or bleeding tendency?

Yes

Discuss with senior CED medic.

No

No imaging required.
- Use clinical judgement (and senior colleagues) to determine whether further observation is required.
- When fit for discharge, ensure short and medium term sequelae are addressed.