Child presents to ED with a head injury

Assess risk of intracranial injury (use guide over page)

Consider potential for other injuries/illnesses, non-accidental injury and C-spine precautions

STABLE

LOW RISK

Immediate head CT or period of observation as per senior advice (see Guideline)

INTERMEDIATE RISK

Observation

Careful and repeated examination

Symptoms persist/worsen/progress?

No

Yes

No significant symptoms & ≤ 4-6 hours post injury

Yes

No

Meets discharge criteria? (Box A)

Discharge with advice

Admit to SSU or inpatient service

INTERMEDIATE RISK

High Risk

HIGH RISK

Head CT

CT +/- sedation (contact RSQ if unavailable locally)

Careful & repeated examination to identify clinical deterioration/signs of raised ICP (Box B)

CT normal?

Yes

No

Significant symptoms/signs persist?

No

Yes

Refer to Paediatric Neurosurgery/Paediatric service as per local practice

Refer to Paediatric Neurosurgery +/- Critical Care

UNSTABLE (including raised ICP)

Seek early specialist assistance

Emergency Management (Resuscitate using ABCD)

- Provide high flow oxygen
- Support ventilation (BVM)
- +/- ETI intubation
- IV or IO access
- IV fluid boluses 10-20 mL/kg
- Sodium Chloride 0.9% as required
- Check BGL – give Glucose 10% IV 2 mL/kg as required

Specific management of raised ICP (Box B):

- Elevate head 20-30°
- Active airway management to avoid hypercarbia (aim for pCO₂ 35-40 mmHg)
- Brief periods of hyperventilation may be beneficial if impending herniation
- Active seizure management
- Consider hyperosmolar agents (Hypertonic Saline/Mannitol see dosing over page)

Urgent CT scan

Refer to Paediatric Neurosurgery/Paediatric service as per local practice

ALERT – Low risk/minor head injury is not no risk.

All carers of children discharged, whether or not imaging has been performed, should receive verbal and written head injury advice including to seek medical care if low grade or vague symptoms persist +/- return to sport advice.

Box A: Discharge criteria

Child may be safely discharged if all of the following are met:
- GCS remains at 15
- No concerns of non-accidental injury
- No concerns of serious alternate/concurrent diagnosis
- Caregiver concerned addressed
- Caregiver can safely manage the child at home and can return in event of deterioration

Consider seeking senior emergency/paediatric advice as per local practice

Box B: Signs of raised intracranial pressure (ICP)

- Deteriorating or diminished level of consciousness
- Abnormal posture (decorticate or decerebrate)
- Abnormal pupillary responses, unilateral or bilateral dilation
- Abnormal oculocephalic reflexes (doll’s eye movement or dysconjugate upward gaze)
- Abnormal breathing patterns (hyperventilation, Cheyne-Stokes, apnoea)
- Cushing’s triad (hypertension + bradycardia + breathing abnormalities) is a late sign.

Seek senior emergency/ paediatric advice as per local practice

Seek urgent paediatric critical care / neurosurgical advice (onsite or via Retrieval Services Queensland (RSQ) on 1300 799 127)
## Head injury – Emergency management in children – Medications

### Risk stratification of intracranial injury in children following head trauma

<table>
<thead>
<tr>
<th>Low risk</th>
<th>Intermediate risk</th>
<th>High-risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL of the following:</td>
<td>No high-risk features and ≥1 of the following:</td>
<td>≥1 of the following:</td>
</tr>
<tr>
<td>• well appearing child</td>
<td>• severe headache</td>
<td>• GCS &lt;14</td>
</tr>
<tr>
<td>• GCS 15</td>
<td>• vomiting</td>
<td>• focal neurological deficit</td>
</tr>
<tr>
<td>• no intermediate or high-risk features present</td>
<td>• amnesia</td>
<td>• clinical suspicion of:</td>
</tr>
</tbody>
</table>

- **Intermediate risk**
  - post-traumatic seizure
  - altered mental status (including drowsiness, agitation, repetitive questioning, slow verbal response)
  - significant mechanism of injury including:
    - fall from a significant height
    - following MVAs -high-speed, ejected from vehicle or with others significantly injured in the same crash
    - pedestrian/cyclist impacted by car
    - impact from high-speed projectile e.g. golf ball, ceiling fan

- **High-risk**
  - severe headache
  - vomiting
  - amnesia
  - post-traumatic seizure
  - ≥1 of the following:
    - basal skull fracture (raccoon eyes, haemotympanum, Battle’s sign, CSF leak via nose or ears)
    - depressed skull fracture (boggy haematomas, palpable depressions)
    - penetrating injury
    - open skull fracture
    - large haematoma, laceration or bulging fontanelle in young child suspicious for underlying fracture
    - NAI
    - extensive other injuries

### Sodium Chloride 3% (IV) dosing for the treatment of raised ICP

<table>
<thead>
<tr>
<th>Sodium Chloride 3% (Hypertonic Saline 3%) (IV)</th>
<th>3 mL/kg/dose (1–5 mL/kg/dose) over 10-15 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risks</strong></td>
<td>Rebound ICP</td>
</tr>
<tr>
<td></td>
<td>Central pontine myelinosisis</td>
</tr>
<tr>
<td></td>
<td>Subarachnoid haemorrhage</td>
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<tr>
<td></td>
<td>Renal failure</td>
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</tbody>
</table>

### Mannitol (IV) dosing for the treatment of raised ICP

<table>
<thead>
<tr>
<th>Mannitol (IV)</th>
<th>0.25-0.5 g/kg over 10-15 minutes</th>
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<tbody>
<tr>
<td></td>
<td>Higher doses i.e. 1 g/kg may be administered on senior advice.</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Risks</strong></th>
<th>Hypotension</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hyperosmolality</td>
</tr>
<tr>
<td></td>
<td>Rebound elevations in ICP</td>
</tr>
<tr>
<td></td>
<td>Renal failure</td>
</tr>
<tr>
<td></td>
<td>Extravasation</td>
</tr>
</tbody>
</table>

For more information refer to [CHQ-GDL-60023 – Head Injury – Emergency management in children](#)