Indications for CT Scans in Head Injury Patients

The protocol covers following areas:
- Indications for CT head in Head Injury patients
- Indications for Imaging of C-Spine following head injury
- Indications for CT neck following head injury
- Criteria for the discharge of patients who have sustained a head injury

Criteria for performing the CT scan within 1 hour
- GCS less than 13 at time of assessment in A&E
- GCS equal to 13 or 14 two hours after injury
- Any sign of basal skull fracture
- Suspected open and depressed skull fracture
- Recurrent vomiting (clinical judgement should be used regarding the cause in those aged less than or equal to 12 years)
- Post traumatic seizure
- Focal neurological deficit
- Amnesia for greater than 30 minutes of events before impact AND GCS<15 at time of assessment in A&E. The assessment of amnesia will not be possible in pre-verbal children and is unlikely in any child aged under 5 years.

Admission for CT Scan Next Day

The following high risk group of patients with a history of LOC or amnesia (>30 minutes) and GCS<15 on assessment in A&E require urgent scan. If GCS 15 on assessment in A&E, admit for scan next day
- Age > 65
- Coagulopathy (history of bleeding, clotting disorder, current treatment with warfarin)
- Dangerous mechanism of injury (a pedestrian struck by a vehicle, an occupant ejected from a vehicle or a fall from a height greater than 1 metre or 5 stairs)

Admission for 8 hours Observation ± CT Scan

The following patients also require CT scan of the head. During working hours arrange CT scan but out of hours should be admitted for scan the following day as long as they do not have any of the above. However if after 8 hours of observation they are asymptomatic with no headache and have a GCS=15 CT scan is not necessary.
- Documented GCS < 13 but GCS 15 on assessment in A&E
- Age > 65 AND history LOC or amnesia AND GCS=15 on assessment in A&E
- Coagulopathy (history of bleeding, clotting disorder, current treatment with warfarin) AND LOC or amnesia AND GCS=15 on assessment in A&E
- Dangerous mechanism of injury (a pedestrian struck by a vehicle, an occupant ejected from a vehicle or a fall from a height greater than 1 metre or 5 stairs) AND history LOC or amnesia AND GCS=15 on assessment in A&E
- Amnesia for greater than 30 minutes of events before impact AND GCS=15 at time of assessment in A&E. The assessment of amnesia will not be possible in pre-verbal children and is unlikely in any child aged under 5 years.
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**Criteria for escalation CT scan in patients under observation**

Any of the following examples of neurological deterioration should prompt urgent reappraisal by the supervising doctor. An immediate CT scan should be considered in patients confirmed as having any of the changes below:

- Development of agitation or abnormal behaviour (consider intubation)
- A sustained (that is, for at least 30 minutes) drop of one point in GCS level (greater weight should be given to a drop of one point in the motor score of the GCS).
- Any drop of greater than two points in GCS level regardless of duration or GCS sub-scale.
- Development of severe or increasing headache or persistent vomiting.
- New or evolving neurological symptoms or signs such as pupil inequality or asymmetry of limb or facial movement.
Cervical Spine Imaging in Head Injury Patients

Cervical spine X-rays
Selection of patients for cervical spine X-rays. Patients with any one of the following risk factors should have three-view radiographs (of good technical quality) of the cervical spine immediately requested.

- Midline cervical spine tenderness
- GCS less than 15 at the time of assessment.
- Paraesthesia in the extremities.
- Focal neurological deficit.
- Not possible to test for range of motion in the neck (safe assessment of range of motion can be performed with the following: simple rear-end motor vehicle collision, sitting position in A&E, ambulatory at any time since injury, delayed onset of neck pain, absence of midline cervical spine tenderness).
- Patient not able to actively rotate neck to 45 degrees to the left and right (if assessment is possible).
- Cervical spine imaging should also be immediately requested in the patients with the following risk factors provided they have some neck pain or tenderness.
- Age greater than or equal to 65 years.
- Dangerous mechanism of injury (fall from greater than 1 metre or five stairs; axial load to head for example, diving; high-speed motor vehicle collision greater than 65 miles per hour; rollover motor accident; ejection from a motor vehicle; accident involving motorised recreational vehicles; bicycle collision). A lower threshold for height of falls should be used when dealing with infants and young children (that is, aged less than 5 years).

Cervical Spine Imaging of Infants and Children

- Children aged 10 years or more can be treated as adults for the purposes of cervical spine imaging.
- In children under 10 years, because of the increased risks associated with irradiation, particularly to the thyroid gland, and the generally lower risk of significant spinal injury, CT of the cervical spine should only be used in exceptional circumstances (for example, cases where there is a strong suspicion of injury despite normal plain films, or cases where there is a strong suspicion of injury and plain films are inadequate).
- Children under 10 years should receive anterior/posterior and lateral views only.
- Abnormalities or uncertainties in those under 10 years should be discussed with a Radiologist first in order to determine necessity for CT scan.
**Indications for CT Neck**

When patients are intubated and are having CT head, CT neck to be done at the same time. The radiologist will report on the CT neck the following day and the neck should be immobilized in the meantime. Where it is not possible to achieve adequate cervical spine radiographs, a neck collar should be employed, if clinically appropriate, and the images discussed with a radiologist during the normal working day. A decision will then be made whether to proceed to CT.

**Discharge Criteria**

No patients presenting with a head injury should be transferred to the community until they have achieved GCS equal to 15, or normal consciousness in infants and young children.

**Discharge of specific patient groups.**

- Low risk patients with GCS equal to 15 – if CT is not indicated on the basis of examination, and there are no other factors that warrant a hospital admission, the Clinician may conclude a low risk of clinically significant brain injury and transfer the patient to community.

- Patients with normal imaging of the head – If patient has normal imaging of the head, and GCS has returned to 15 and there are no other factors that warrant a hospital admission, patient may be discharged to community.

- Patients with normal Imaging of cervical spine - If patient has normal imaging of the C-Spine, and GCS has returned to 15 and there are no other factors that warrant a hospital admission, patient may be discharged to community.

- Patients admitted for observation – If all significant symptoms have resolved, patient may be discharged home with suitable supervision.

- Patients at risk of non-accidental injury – infants or children presenting with injuries that require CT of the head or C-spine, should be assessed by a clinician experienced in the detection of non-accidental injury. It is expected that all personnel involved in the triage of infants or children with head injury, should have some training in the detection of non-accidental injury.

**Reference:**
National Institute for Clinical Excellence (NICE) June 2003 Head Injury