NHS
National Institute for Health and Clinical Excellence

Quick reference guide

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Head injury

Triage, assessment, investigation and early management of head injury in infants, children and adults

Head injury: triage, assessment, investigation and early management of head injury in infants, children and adults (NICE clinical guideline 56)
This replaces NICE clinical guideline 4, issued in June 2003.

This quick reference guide, which has been prepared with ambulance and hospital staff in mind, incorporates sections of the NICE guideline that have been updated in line with new evidence, and recommendations that have remained unchanged. More information on the sections that have been updated, which were specified at the beginning of the updating procedure, is available in the NICE guideline.

The original guideline (CG4) and this partial update have been developed by the National Collaborating Centre for Acute Care.

This quick reference guide should be interpreted, where necessary, with reference to the NICE guideline (see page 19).

Patient-centred care

- Staff should introduce themselves to family members or carers and briefly explain what they are doing – a photographic board with the names and titles of personnel can be helpful.
- Information sheets detailing the nature of head injury and any investigations likely to be used should be available in the emergency department – the patient version of the NICE guideline may also be helpful (see page 19).
- Staff should consider how best to share information with children and introduce them to the possibility of long-term complex changes in a person they love – literature produced by patient support groups may help.
- Staff should encourage carers and relatives to talk and make physical contact with the patient, but also encourage family and friends to take a break if they spend long hours at the bedside.
- Leaflets or contact details for patient support organisations (local or national) should be displayed to enable family members to access further information.

Initial assessment in the emergency department

- All patients presenting to an emergency department with a head injury should be assessed by a trained member of staff within a maximum of 15 minutes of arrival at hospital. Part of this assessment should establish whether they are high risk or low risk for clinically important brain injury and/or cervical spine injury, using the guidance on patient selection and urgency for imaging (head and cervical spine).

Urgency of imaging

- Computed tomography (CT) imaging of the head should be performed (that is, imaging carried out and results analysed) within 1 hour of the request having been received by the radiology department in those patients where imaging is requested because of any of the risk factors shown by ⁎ in the algorithm on page 8.
- Patients who have any of the risk factors shown by ▲ in the algorithm on page 8 and none of the ⁎ risk factors should have CT imaging of the head performed within 8 hours of the injury (imaging should be performed immediately in these patients if they present 8 hours or more after their injury).
- Children under 10 years of age with a Glasgow Coma Score (GCS) of 8 or less should have CT imaging of the cervical spine within 1 hour of presentation or when they are sufficiently stable.
- Imaging of the cervical spine should be performed within 1 hour of a request having been received by the radiology department or when the patient is sufficiently stable. Where a request for urgent CT imaging of the head (that is, within 1 hour) has also been received, the cervical spine imaging should be carried out simultaneously.

Admission

- In circumstances where a patient with a head injury requires hospital admission, it is recommended that the patient be admitted only under the care of a team led by a consultant who has been trained in the management of this condition during his/her higher specialist training. The consultant and his/her team should have competence (defined by local agreement with the neuroscience unit) in assessment, observation and indications for imaging (see pages 14 and 15); inpatient management; indications for transfer to a neuroscience unit (see page 12); and hospital discharge and follow-up (see pages 16 and 17).

Organisation of transfer of patients between referring hospital and neuroscience unit

- Local guidelines on the transfer of patients with head injuries should be drawn up between the referring hospital trusts, the neuroscience unit and the local ambulance service, and should recognise that:
  - transfer would benefit all patients with serious head injuries (GCS ≤ 8), irrespective of the need for neurosurgery

– if transfer of those who do not require neurosurgery is not possible, ongoing liaison with the neuroscience unit over clinical management is essential.

Advice about long-term problems and support services

- All patients and their carers should be made aware of the possibility of long-term symptoms and disabilities following head injury and should be made aware of the existence of services that they could contact should they experience long-term problems. Details of support services should be included on patient discharge advice cards.

Pre-hospital management

First priority: treat the greatest threat to life and avoid further harm.

Initial assessment and management

Assess and manage according to clear principles and standard practice, as embodied in:

- Advanced Trauma Life Support (ATLS) course/European Trauma course
- International Trauma Life Support (ITLS) course
- Pre-hospital Trauma Life Support (PHTLS) course
- Advanced Trauma Nurse Course (ATNC)
- Trauma Nursing Core Course (TNCC)
- Joint Royal Colleges Ambulance Service Liaison Committee (JRCALC) Clinical Practice Guidelines for Head Trauma
- Advanced Paediatric Life Support (APLS)/European Paediatric Life Support (EPLS) course
- Pre-hospital Paediatric Life Support (PHPLS) course
- Paediatric Education for Pre-hospital Professionals (PEPP) course.

Spine immobilisation

Full cervical spine immobilisation if any of these are present (unless other factors prevent it):

- GCS < 15 on initial assessment by healthcare professional
- neck pain or tenderness
- focal neurological deficit
- paraesthesia in the extremities
- any other clinical suspicion of cervical spine injury.

Maintain immobilisation until full risk assessment including clinical assessment (and imaging if necessary) indicates removal is safe.

Destination

- Transport patient directly to a facility identified as having the appropriate resources to resuscitate, investigate and initially manage any patient with multiple injuries.

Phoning ahead

- **GCS ≤ 8:** make standby call to destination to ensure appropriately experienced professionals are available to treat patient and to prepare for imaging.

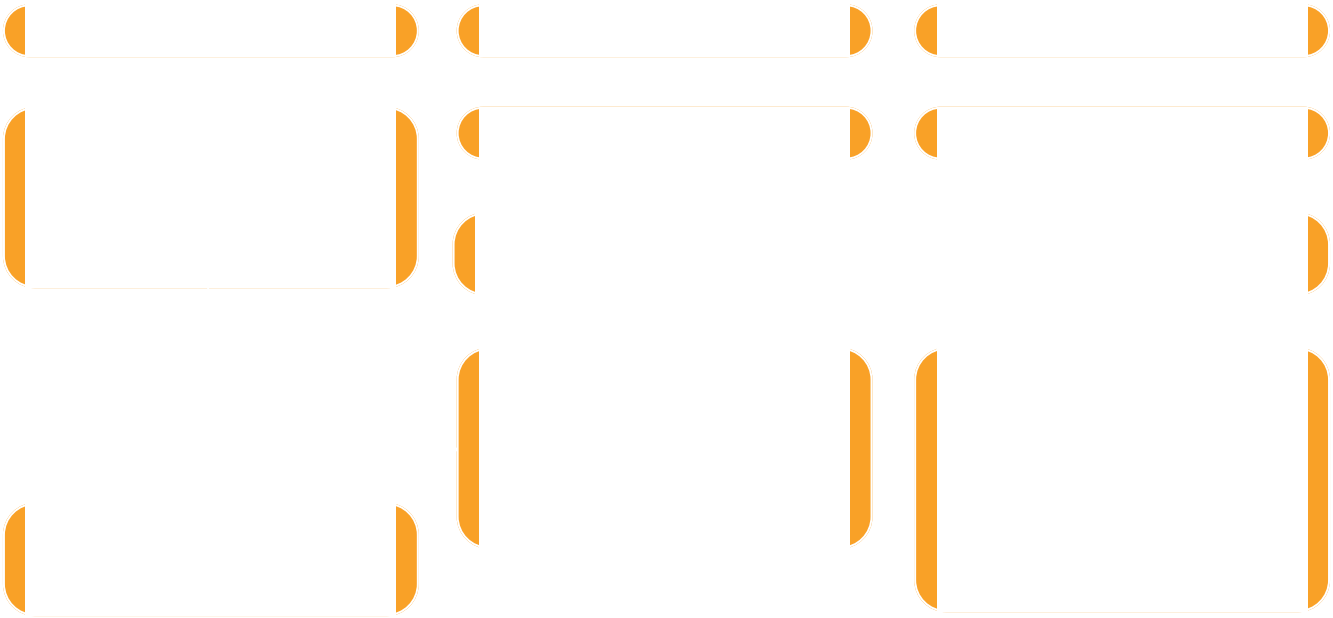
Training

Ambulance crews should:

- be fully trained in the adult and paediatric versions of the Glasgow Coma Scale
- be trained in the detection of non-accidental injury, and should pass information to emergency department personnel when relevant signs and symptoms arise.

Assessment in emergency department

Stabilise airway, breathing and circulation (ABC) before attending to other injuries.



Pain management

- Manage pain effectively and reassure patients.
- Treat significant pain with low dose of intravenous opioids titrated against clinical response and baseline cardiorespiratory measurements.

Training

- All emergency department clinicians involved in assessing patients with head injuries should be able to assess the presence and absence of the risk factors listed on pages 8–11 on selection and urgency for imaging – training should be available as required to ensure this.
- Emergency department (and all in-hospital) observations of patients with head injuries should only be carried out by professionals competent in the assessment of head injury.
- All those involved in the assessment of infants and children with head injury should be trained to detect non-accidental injury.

If patient returns to emergency department within 48 hours of discharge with persistent complaint relating to initial head injury, involve a senior clinician with experience in head injuries and consider CT scan**.**

Investigation for clinically important brain injury

CT imaging of the head is the primary investigation of choice.

Selection of adults for CT scanning of head

[1]If patient presents out of hours and is ≥ 65, has amnesia for events more than 30 minutes before impact or there was a dangerous mechanism of injury, it is acceptable to admit for overnight observation, with CT imaging the next morning, **unless CT result is required within 1 hour because of the presence of additional clinical findings listed above**.

Selection of children (under 16) for CT scanning of head

- Witnessed loss of consciousness lasting > 5 minutes
- Amnesia (antegrade or retrograde) lasting > 5 minutes
- Abnormal drowsiness
- 3 or more discrete episodes of vomiting
- Clinical suspicion of non-accidental injury
- Post-traumatic seizure but no history of epilepsy
- Age > 1 year: GCS < 14 on assessment in the emergency department
- Age < 1 year: GCS (paediatric) < 15 on assessment in the emergency department
- Suspicion of open or depressed skull injury or tense fontanelle
- Any sign of basal skull fracture (haemotympanum, 'panda' eyes, cerebrospinal fluid leakage from ears or nose, Battle's sign)
- Focal neurological deficit
- Age < 1 year: presence of bruise, swelling or laceration > 5 cm on the head
- Dangerous mechanism of injury (high-speed road traffic accident either as pedestrian, cyclist or vehicle occupant, fall from > 3 m, high-speed injury from a projectile or an object)

Investigation of non-accidental injury in children

A clinician with expertise in non-accidental injuries in children should be involved in any suspected case of non-accidental injury in a child. Consider: skull X-ray as part of a skeletal survey; ophthalmoscopic examination for retinal haemorrhage; examination for pallor, anaemia, tense fontanelle and other suggestive features. Imaging such as CT and magnetic resonance imaging (MRI) may be required to define injuries.

Investigation for injuries to the cervical spine

Which investigation?

- **In most circumstances, plain radiographs are the initial investigation of choice to detect cervical spine injuries – three views of sufficient quality for reliable interpretation (two views for children under 10 years of age).**
- CT imaging is recommended in some circumstances – see page 11.
- Children under 10 have increased risk from irradiation, so restrict CT imaging of cervical spine to children with indicators of more serious injury, in circumstances such as:
  - severe head injury (GCS ≤ 8)
  - strong suspicion of injury despite normal plain films
  - plain films are inadequate.

As a minimum, CT imaging should cover any areas of concern or uncertainty on plain film or clinical grounds.

Timing of cervical spine imaging

- **Imaging indicated:** imaging within 1 hour of request being received by the radiology department or when patient sufficiently stable.
- **Children under 10 with GCS ≤ 8:** CT imaging of the cervical spine within 1 hour of presentation or when sufficiently stable.

Selection of adults and children (age 10+) for imaging of the cervical spine

- Patient cannot actively rotate neck to 45 degrees to left and right (if safe to assess the range of movement in the neck)[2]
- Not safe to assess range of movement in the neck[2]
- Neck pain or midline tenderness plus:
  - age ≥ 65 years, or
  - dangerous mechanism of injury[3]
- Definitive diagnosis of cervical spine injury required urgently (for example, prior to surgery)

- GCS < 13 on initial assessment
- Has been intubated
- Plain film series technically inadequate (for example, desired view unavailable), suspicious or definitely abnormal
- Continued clinical suspicion of injury despite normal X-ray
- Patient is being scanned for multi-region trauma

Children under 10 years

- Use anterior/posterior and lateral radiographs without an anterior/posterior peg view.
- Use CT imaging to clarify abnormalities or uncertainties.

When to involve the neurosurgeon

- Discuss the care of all patients with new, surgically significant abnormalities on imaging with a neurosurgeon (definition of 'surgically significant' to be developed by local neurosurgical unit and agreed with referring hospitals).
- Regardless of imaging, other reasons for discussing a patient's care plan with a neurosurgeon include:
  - persisting coma (GCS ≤ 8) after initial resuscitation
  - unexplained confusion for more than 4 hours
  - deterioration in GCS after admission (pay greater attention to motor response deterioration)
  - progressive focal neurological signs
  - seizure without full recovery
  - definite or suspected penetrating injury
  - cerebrospinal fluid leak.

Transfer from secondary setting to neuroscience unit

Follow local guidelines on patient transfer and transfer of responsibility for patient care – these should be drawn up by the referring hospital trusts, neuroscience unit and local ambulance service. They should recognise that transfer would benefit all patients with serious head injuries (GCS ≤ 8), irrespective of the need for neurosurgery, but if transfer of those who do not require neurosurgery is not possible, ongoing liaison with the neuroscience unit over clinical management is essential.

- For emergency transfers, the patient should be accompanied by a doctor with appropriate training and experience[4] and an adequately trained assistant.
- A child or infant should be accompanied by staff experienced in the transfer of critically ill children.
- The transfer team should be provided with a means of communicating with their base hospital and the neurosurgical unit during the transfer (a portable phone may be suitable providing it is not used within 1 metre of medical equipment prone to electrical interference, such as infusion pumps).
- **The multiply injured patient:** consider the possibility of occult extracranial injuries, and do not transfer to a service unable to deal with other aspects of trauma.

Medical care during transfer

- **In all circumstances:** complete initial resuscitation and stabilisation of the patient and establish comprehensive monitoring before transfer to avoid complications during the journey.
- **Patient persistently hypotensive despite resuscitation:** do not transport until the cause of hypotension has been identified and the patient stabilised.

[4] See the NICE guideline for more information, details on page 19.

Intubation and ventilation

Circumstances	Action
• Coma – GCS ≤ 8 (use paediatric scale for children) • Loss of protective laryngeal reflexes • Ventilatory insufficiency: – hypoxaemia (PaO_2 < 13 kPa on oxygen) – hypercarbia ($PaCO_2$ > 6 kPa) • Spontaneous hyperventilation causing $PaCO_2$ < 4 kPa • Irregular respirations	• Intubate and ventilate immediately
• Significantly deteriorating conscious level (1 or more points on motor score), even if not coma • Unstable fractures of the facial skeleton • Copious bleeding into mouth • Seizures	• Intubate and ventilate before the journey starts
• Ventilate an intubated patient with muscle relaxation and appropriate short-acting sedation and analgesia • Aim for: – PaO_2 > 13 kPa – $PaCO_2$ 4.5–5.0 kPa • If clinical or radiological evidence of raised intracranial pressure, more aggressive hyperventilation is justified • Increase the inspired oxygen concentration if hyperventilation is used • Adult: maintain mean arterial pressure at ≥ 80 mmHg by infusing fluid and vasopressors as indicated • Child: maintain blood pressure at level appropriate for age	

Let carers and relatives have as much access to the patient as is practical during transfer and keep them fully informed on the reasons for transfer and the transfer process.

Admission

Criteria for admission

- New, clinically significant abnormalities on imaging.
- Not returned to GCS 15 after imaging, regardless of the imaging results.
- Criteria for CT scanning fulfilled, but scan not done within appropriate period, either because CT not available or because patient not sufficiently co-operative to allow scanning.
- Continuing worrying signs (for example, persistent vomiting, severe headaches).
- Other sources of concern (for example, drug or alcohol intoxication, other injuries, shock, suspected non-accidental injury, meningism, cerebrospinal fluid leak).

- **Patient with a head injury:** admit under the care of a team led by a consultant trained in head injury management during higher specialist training (see page 4 for full recommendation).
- **Patient with multiple injuries:** admit under the care of the team trained to deal with most severe and urgent problem.

Observations

- Medical, nursing and other staff caring for head-injured patients admitted for observation should be capable of performing the observations listed in the following section.
- Dedicated training should be available to relevant staff to enable them to acquire and maintain observation and recording skills – specific training is required for the observation of infants and young children.
- Observations of infants and young children under 5 years should be performed only by units with staff experienced in the observation of infants and young children with a head injury (this may be in normal paediatric observation settings, as long as staff have the appropriate experience).

Making observations

- Perform and record observations on a half-hourly basis until GCS = 15.
- When GCS = 15, minimum frequency of observations is:[5]
  - half-hourly for 2 hours
  - then 1-hourly for 4 hours
  - then 2-hourly thereafter.

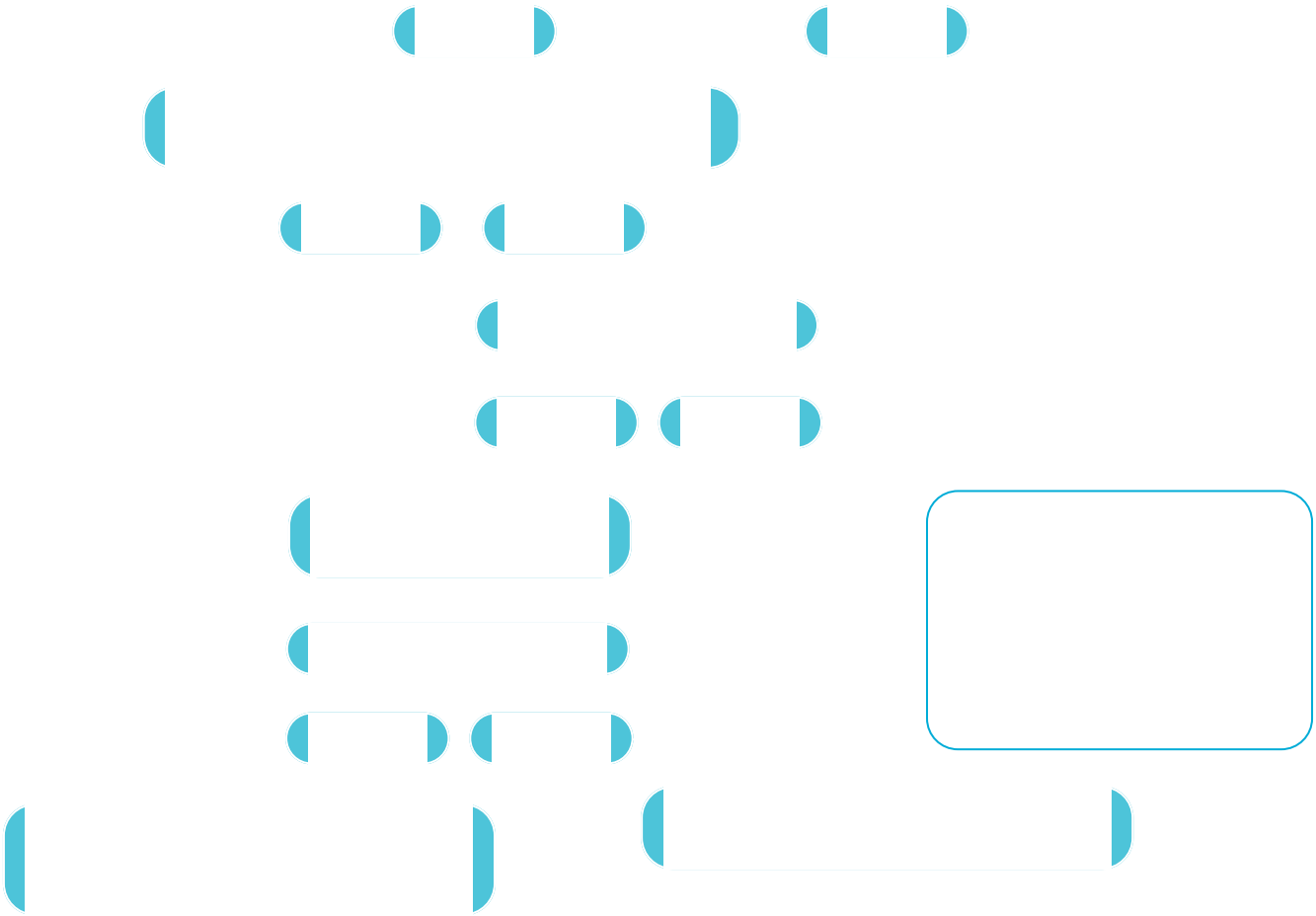
[5] Starting after the initial assessment in emergency department

Making observations

- If patient deteriorates to GCS < 15 after initial 2-hour period, revert to half-hourly observations and follow original schedule.
- Minimum acceptable documented neurological observations:
  - GCS (adult or paediatric, as appropriate)
  - pupil size and reactivity
  - limb movements
  - respiratory rate
  - heart rate
  - blood pressure
  - temperature
  - blood oxygen saturation.

Patient changes requiring review

- Agitation or abnormal behaviour developed
- GCS dropped by 1 point and lasted for at least 30 minutes (give greater weight to a drop of 1 point in the motor response score)
- Any drop of 3 or more points in the eye-opening or verbal response scores, or 2 or more points in the motor response score
- Severe or increasing headache developed or persistent vomiting
- New or evolving neurological symptoms or signs, such as pupil inequality or asymmetry of limb or facial movement



Discharge

- **Do not discharge any patient who presents with a head injury until GCS = 15.**
- **For infants and young children, normal consciousness as assessed by the paediatric Glasgow Coma Scale should be achieved before discharge.**

Specific groups

No carer at home: discharge only if suitable supervision arrangements have been organised, or when the risk of late complications is deemed negligible (in general, only discharge when certain there is somebody suitable at home to supervise the patient).

Low risk, CT not done, GCS = 15: clinician may conclude risk is low enough to allow discharge if CT not indicated from history and examination, no other factors warrant admission and there are appropriate support structures for safe transfer and subsequent care.

Normal imaging of the head: clinician may conclude risk is low enough to allow discharge if patient has returned to GCS 15, no other factors warrant admission and there are appropriate support structures for safe transfer and subsequent care.

Normal imaging of the cervical spine: clinician may conclude risk is low enough to allow discharge if patient has returned to GCS 15, no other factors warrant admission and there are appropriate support structures for safe transfer and subsequent care.

Admitted for observation: discharge after resolution of all significant symptoms and signs providing suitable home supervision arrangements exist **unless** patient was admitted out of hours and requires a CT scan the following morning (see footnote on page 8).

At risk of non-accidental injury: do not discharge an infant or child with a head injury that required imaging of the head or cervical spine until a clinician experienced in the detection of non-accidental injury has assessed him or her.

Discharge advice

- All patients should receive verbal advice and a written head injury advice card before discharge from emergency department or ward (an example is available from www.nice.org.uk/CG56).
- Discuss details of the advice card before discharge – this should include instructions on contacting community services in the event of delayed complications.
- Alert patients and carers to the possibility that some patients may make a quick recovery, but go on to experience delayed complications.
- Make all patients and carers aware of the possibility of long-term symptoms and disabilities and of the existence of services that they could contact should they experience long-term problems (details of support services should be included on patient discharge advice cards).
- If necessary, use other formats to communicate discharge advice (for example, tapes).
- If there is a need, facilitate communication in languages other than English.
- Give information and advice on alcohol or drug misuse to patients who presented to the emergency department with drug or alcohol intoxication if they are now fit for discharge.

Outpatient appointments

- **Every patient who has undergone imaging of their head and/or been admitted to hospital:** refer to GP for follow-up within 1 week after discharge.
- **If problems persist:** there should be an opportunity for referral from primary care to an outpatient appointment with a professional trained in assessment and management of brain injury sequelae.

Communication with community services

- **Patient who attended emergency department with head injury:** send letter or email to GP within 1 week of end of hospital episode – include details of the clinical history and examination, and ensure patient or carer has access (letter/email is open or patient given a copy).
- **School-aged child who received head or cervical spine imaging:** send letter or email to GP and school nurse within 1 week of end of hospital episode – include details of the clinical history and examination.
- **Pre-school-aged child who received head or cervical spine imaging:** send letter or email to GP and health visitor within 1 week of end of hospital episode – include details of the clinical history and examination.

- It is recommended that GPs, nurse practitioners, dentists and ambulance crews should receive training, as necessary, to ensure that they are capable of assessing the presence or absence of the risk factors listed in section 1.2.2 of the NICE guideline.
- Telephone advice services (for example, NHS Direct, emergency department helplines) should refer people who have sustained a head injury to the emergency ambulance services (that is, 999) for emergency transport to the emergency department if they have experienced any of the risk factors in box 1 of the NICE guideline.
- Community health services (general practice, ambulance crews, NHS walk-in centres, dental practitioners) and NHS minor injury clinics should refer patients who have sustained a head injury to a hospital emergency department, using the ambulance service if deemed necessary (see section 1.3.1 of NICE guideline), if any of the risk factors listed in box 3 in the NICE guideline are present.
- Some patients may require an extended period in a recovery setting because of the use of general anaesthesia during CT imaging.
- Plain X-rays of the skull should not be used to diagnose significant brain injury without prior discussion with a neuroscience unit. However, they are useful as part of the skeletal survey in children presenting with suspected non-accidental injury.
- If CT imaging is unavailable because of equipment failure, patients with GCS 15 can be admitted for observation. Arrangements should be in place for urgent transfer to a centre with CT scanning available should there be a clinical deterioration that indicates immediate CT scanning is necessary.