

Traumatic Brain Injury

Acute care and pre-hospital assessment

» A distillation of best practice reflecting ACC's current position

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- Pre-hospital assessment is aimed at identifying patients with potential traumatic brain injury (TBI) and especially:
 - hypoxia or hypotension
 - complications, especially intracranial haemorrhage
 - other injuries, especially of the cervical spine.
- Irritability and uncooperative behaviour should never be assumed to be due to alcohol or drugs.
- Most patients can be safely assessed and managed in the community.
- Amnesia and a falling, or persistently reduced, Glasgow Coma Score are associated with an increased risk of intracranial complications.
- Well-organised trauma services are shown to reduce mortality (by 20–50%) from TBI.

Background

The traumatic brain injury (TBI) Guideline, 'The Diagnosis, Acute Management and Rehabilitation of People after Traumatic Brain Injury',¹ is due to be published shortly.

This Review summarises the 'Pre-hospital Assessment, Management and Referral to Hospital' chapter, which is an updated version of the NICE Head Injury Guidelines², and is adapted to the New Zealand environment. The principles of pre-hospital assessment are based on the administration of immediate care to treat the greatest threat to life. If management is effective at this stage, it should reduce the risk of further complications.

The two key indicators of the potential for intracranial bleeding are the Glasgow Coma Score (GCS) and the presence of amnesia (anterograde or retrograde).

Glasgow Coma Scale (GCS)

The GCS is calculated by adding the best obtainable result from each of the three elements of the following table:

Best Eye Response	Best Verbal Response	Best Motor Response
1. No eye opening	1. No verbal response	1. No motor response
2. Eye opening to pain	2. Incomprehensible sounds	2. Extension to pain
3. Eye opening to verbal command	3. Inappropriate words	3. Flexion to pain
4. Eye opening spontaneously	4. Confused	4. Withdrawal from pain
	5. Orientated	5. Localising pain
		6. Obeys commands

Pre-hospital Assessment

Assessment is aimed at identifying patients with TBI, especially those at risk of:

1. actual or potential hypoxia and hypotension
2. acute complications of TBI, especially intracranial haemorrhage
3. other injuries requiring urgent management, especially of the cervical spine
4. the severities of TBI, and implications for ongoing management and follow up.

Assessment should identify the following as risk indicators:

- GCS, now and any changes
- history of loss of consciousness (LoC) – may be difficult
- presence and duration of anterograde and post-traumatic amnesia (easier to assess than LoC)
- presence of neurological deficits and/or seizures
- coagulopathies including warfarin therapy
- headache, not controlled by simple analgesia
- mechanism of injury
- vomiting since injury
- irritability or altered behaviour
- evidence of open, depressed or basal skull fracture
- evidence of trauma above the clavicles
- evidence of drug or alcohol intoxication.

Warning: Abnormalities of GCS or neurological status should never be assumed to be due to intoxication with alcohol or drugs. Irritability and poor cooperation should be assumed to be due to cerebral irritation.

Indications for Transfer to Emergency Department

A: Urgent transfer by emergency services is indicated if:

- there is any deterioration of condition
- GCS is less than 15
- there is evidence of a focal neurological deficit or any seizure
- there is suspicion of a skull fracture or penetrating injury
- there is a high energy injury eg. high speed motor vehicle collision, fall from a height of greater than one metre etc
- there is suspected neck injury
- alternative transport is unavailable.

B: Transfer in company of competent adult if:

- there is any LoC or amnesia
- the headache is not controlled by simple analgesia
- vomiting occurs
- there is a history of bleeding, clotting disorder, or warfarin therapy
- there is evidence of drug or alcohol intoxication
- there is a history of neurosurgery
- there is the suspicion of a non-accidental injury
- the patient is age 65 and older, or first year of life
- there is any concern regarding other symptoms.

Assessment by GP, After Hours, or Accident and Medical Centre if:

- home supervision is not available.
- there is continuing concern by patient or carer.

Delayed Presentation

Presentation may be delayed for a number of reasons and by a considerable period. Association of symptoms with a head injury may be difficult. If more than 24 hours has passed, referral to hospital is rarely required, but should be considered if any of the above referral indications apply. Additionally, altered behaviour, especially in the elderly or frail, should prompt consideration of the possibility of a chronic subdural haematoma.

Post-traumatic Amnesia

Post-traumatic amnesia is associated with an increased risk of intracranial complications. However, evidence on the length and type of amnesia that precedes these complications is inconsistent.³ Recent study appears to suggest that "retrograde amnesia (ie. impairment of memories before trauma) is a more important indicator of significant injury."⁴ The Guideline recommends that post-traumatic amnesia should be prospectively assessed and recorded (ie. before it has resolved) when assessing people with a suspected brain injury, where possible.

Organisation of Trauma Services

There is consistent evidence to support the fact that coordinated trauma services can cause a reduction in mortality in serious injury, including serious neurotrauma. Trauma systems are shown to reduce mortality (by 20-50%) from TBI.⁵

Recommendations for the management of a system of care for people with severe TBI include:

- planning of pre-hospital management and triage
- transport directly to the trauma centre
- maintenance of appropriate call schedules
- audit and quality improvement reviews
- staff participation in trauma education programmes.

Referral for Rehabilitation

Patients with moderate or severe TBI will require rehabilitation usually through specialised units. People with mild TBI should usually be followed up by their General Practitioner to ensure resolution of all symptoms. Failure to resolve should prompt consideration of referral for rehabilitation. Indications for such referral will be discussed in the ACC Review on Rehabilitation Services following TBI.

Two further ACC Reviews on TBI will follow this acute care management series. The focus of these forthcoming Reviews will be on the rehabilitation of people after a TBI.

References

1. New Zealand Guidelines Group. The Diagnosis, Acute Management and Rehabilitation of People after Traumatic Brain Injury. Wellington: ACC; due for publication shortly.
2. National Collaborating Centre for Acute Care. Head injury: triage, assessment, investigation and early management of head injury in infants, children and adults. London: National Institute for Clinical Excellence (NICE); 2003.
3. Borg J, et al. Diagnostic procedures in mild traumatic brain injury: results of the WHO Collaborating Centre Task Force on Mild Traumatic Brain Injury. J Rehabil Med. 2004; 61-75 (43 Suppl).
4. Stiell I, et al. The Canadian CT Head Rule for patients with minor head injury. Lancet 2001; 357 (9266): 1391.
5. Bullock MR, et al. Management and prognosis of severe traumatic brain injury: Brain Trauma Foundation and American Association of Neurological Surgeons; 2000.