

# Management of Trauma Patients with GCS $\leq$ 13

Explanatory Notes

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## **1.0 Introduction**

1.1 The purpose of this document is to provide explanatory notes to the poster guidance “Management of trauma patients with GCS  $\leq 13$ ”. The guidance is applicable to both adult and children patients, in those hospitals devoid of a neurosurgical service. It is written using process mapping techniques.

1.2 For the purposes of this guideline, head injury is defined as any trauma to the head other than superficial injuries to the face. Head injury is the commonest cause of death and disability in people aged 1–40 years in the UK. Most patients recover without specific or specialist intervention, but others experience long-term disability, or even die from the effects of complications that could potentially be minimised, or avoided with early detection and appropriate treatment.

Glasgow Coma Scale (GCS) is used to identify patients’ conscious level. Head injuries are then classified into mild, moderate, severe with respect to the GCS.

Mild 14-15

Moderate 13-9

Severe  $\leq 8$

This guideline is for patients’ with a moderate to severe head injury.

Patients with a GCS classified as mild head injury should be triaged and managed as per local guidelines.

1.3 The guidance is supported by the following recommendations:

- CRASH 3: Effects of tranexamic acid on death, disability, vascular occlusive events and other morbidities in patients with acute traumatic brain injury: a randomised, placebo-controlled Trial (2019).
- NICE Guideline CG176 – Head Injury: assessment and early management (2019).
- Brain Trauma Foundation: Guidelines for the Management of Severe Traumatic Brain Injury 4<sup>th</sup> Ed (2016).
- SIGN Guideline 110 – Early Management of Patients with a Head Injury (2009).
- NCEPOD - Trauma: Who Cares? (2007).
- AAGBI - Safe transfer of the brain-injured patient: trauma and stroke. (2019).

1.4 This guideline required updating following new evidence and publications as per 1.3.

1.5 The guidance is presented in poster format, “Management of trauma patients with GCS  $\leq 13$ ”, and is intended to be displayed in all Emergency Departments (ED). The poster includes contact details for the two neurosurgical centres in the North of England and Cumbria, The James Cook University Hospital, Middlesbrough and the Royal Victoria Infirmary, Newcastle-upon-Tyne. The poster can also be found in the transfer section of the North of England Critical Care Network (NoECCN) website ([www.noeccn.org.uk](http://www.noeccn.org.uk)), and Appendix 4.

1.6 Any individual or department can request a copy of the guidance in poster format. Contact NoECCN ([www.noeccn.org.uk](http://www.noeccn.org.uk)).

## **2.0 Intended Outcomes**

2.1 This guidance aims to assist in time-critical transfer of a patient to a neurosurgical centre, to reduce mortality and morbidity. This will be achieved through the following objectives:

- Rapid airway assessment with expedited safe management in a head injured patient.
- Safe and rapid transfer to CT scan.
- Early discussion and planning with neurosurgical colleagues.
- Safe, rapid preparation for timely transfer to a neurosurgical centre.
- Evidence based recommendations for the management of moderate to severe traumatic brain injury.

2.2 This guideline does not aim to cover all aspects of neurosurgical pathology. This guidance is targeted at achieving the above outcomes, to reduced morbidity and mortality associated with head injury.

## **3.0 Local Context**

3.1 This guidance supports the implementation of the Trauma Network system by ensuring patients with a head injury arrive at, and are managed, in appropriate hospital settings.

3.2 Whilst triage systems are likely to reduce the number of head injury patients presenting to hospitals that are not Major Trauma Centres (MTC), the need for guidance increases as familiarity is reduced. Patient may also self-present and triage is fluid with time.

3.3 The guidance utilises the requesting procedure agreed by the North East Ambulance Service (NEAS) to reduce transfer time.

## **4.0 Explanatory Notes**

4.1 A senior doctor must direct the care of a moderate-severe head injury patient, with all patient transfers approved by an Emergency Medicine Consultant.

4.2 The initial cABCDE assessment should include a full GCS assessment, though an accurate 'motor' score is of most importance. Assessment should include pupil size and responsiveness, and a random blood glucose should be checked to exclude hypoglycaemia. In non-verbal or paediatric patients a modified GCS for verbal response should be used to provide a similar GCS head injury severity.

4.3 An early assessment should be made for confounding factors to GCS, for example intoxication, and whether active treatment is appropriate; this guideline should not be used in these circumstances, and local guidelines/clinical judgement is required. However, all patients presenting with GCS  $\leq 13$  should undergo a CT head, as per NICE CG 176.

4.4 When the CT scan demonstrates the presence of a traumatic, time-critical, intracranial bleed, the patient should be made safe for transfer to MTC immediately, and receiving teams made aware (See 4.11). The judgement of what constitutes a time-critical bleed should be made by an Emergency Medicine Consultant and any if clarification is needed, then advice should be sought from the Neurosurgical team.

4.5 All other intracranial findings will be managed following agreement between the neurosurgical team and the clinically assessing team(s). Patients with spontaneous intracranial bleeds and trauma should be considered for transfer to an MTC, if any deterioration would require surgical intervention, or if there is difficulty in achieving neuroprotective parameters. It may be that following such discussion, patients do not require transfer, in which case local guidelines should be followed.

4.6 An intubation decision should be made by an appropriately trained and experienced doctor who understands secondary brain injury prevention. See Appendix 2. Local intubation checklists should be utilised.

4.7 For the purpose of this guideline, the term "critical care doctor" is used to describe the doctor responsible for the safe conduct of anaesthesia and patient transfer.

4.8 The process in place for an urgent CT scan will vary between centres but should follow the NICE CG 176 algorithm: selection of adults for CT head scan. Each hospital should have systems in place for urgent CT scan interpretation followed by immediate image transfer to the neurosurgical centre.

4.9 In the case where blood test results (U&E, FBC, Coagulation Screen) are not available at time of transfer, the receiving unit should be made aware of the results as soon as possible. Thromboelastography provides a rapid coagulation assessment, if available, and appropriate management should be instigated ASAP as per local guidelines.

4.10 CRASH-3 administered tranexemic acid (TXA) within 3 hours of traumatic head injury to establish whether there was a reduction in 28 day in-patient mortality. They administered two doses of intravenous TXA: 1g over 10 minutes within 3 hours, followed by 1g over 8 hours. They demonstrated a statistically significant benefit in patients with mild-moderate head injury, but no benefit in severe head injury. Importantly, there were no increased veno-occlusive events or seizures.

4.11 Deviation from this guidance may be justified in select cases, however, such deviations should be made only after discussion and involvement of a suitably trained and experienced consultant.

4.12 The receiving emergency medicine, critical care and neurosurgical teams should be notified of an urgent patient transfer. The RVI switchboard (0191 2336161) will interrupt an ongoing call if the line is engaged to allow an emergency conversation with the on call Neurosurgical Registrar. The Neurosurgical Registrar at JCUH can be reached on 07377 996322. The Emergency Department (ED) should be contacted via Switchboard for the respective hospital, and the referring team should inform the Nurse in Charge or senior doctor at receiving MTC ED.

4.13 The determination of a 'reasonable timeframe' is at the discretion of the referring unit, however as a guide of 30 minutes has been suggested.

4.14 Patient inter- and intra-hospital transfers should follow NoECCN guidelines ([www.noeccn.org.uk](http://www.noeccn.org.uk)). When the patient is stable on the transfer trolley inform NEAS that you require a critical care transfer on 0191 4143144. State "This is a critical care transfer using the transfer trolley, requiring a C1 response. A paramedic crew is not required" (Appendix 3).

## **5.0 Documentation**

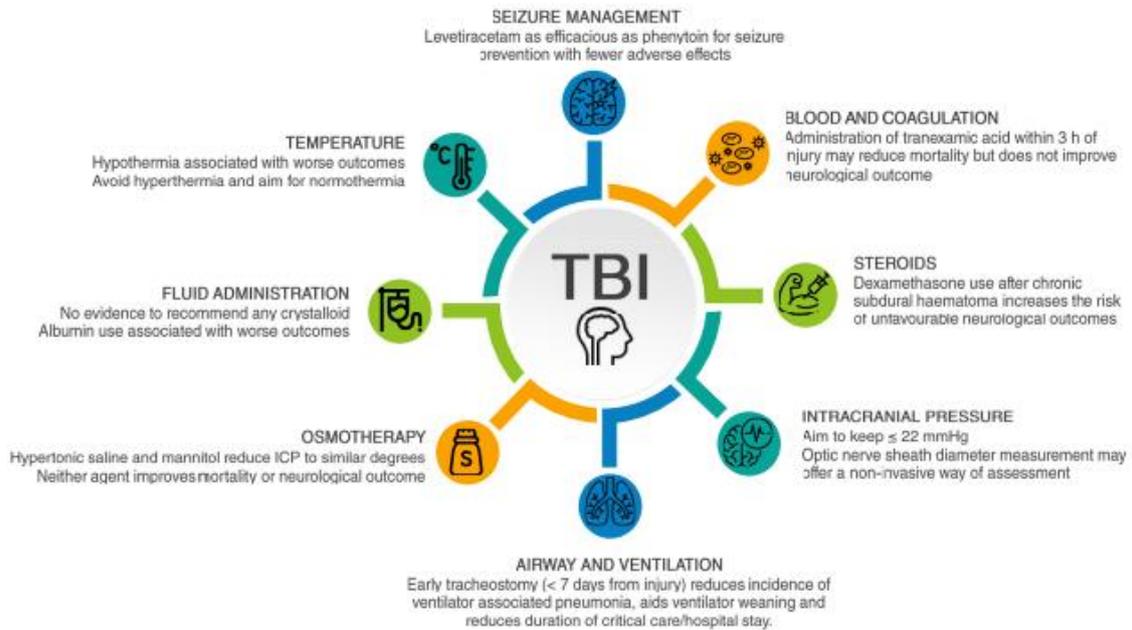
5.1 Documentation should be of a standard acceptable to each hospital and department.

5.2 To ensure adequate documentation and to clarify communication and handover, a **referapatient.org** referral should be completed, as well as contacting neurosurgical team by phone. This will ensure adequate documentation of examination findings and patient background. Note. the referapatient.org referral should not delay transfer but should be completed in a timely manner.

5.3 The transfer should be documented using the NoECCN record. This is available in paper format in each centre, and can also be found on the network website:

[https://www.noeccn.org.uk/resources/Documents/Transfer%20Group/Transfer%20resources%20and%20documents/ACC%20Transfer%20Checklist%20and%20Observation%20Chart%2001\\_19.pdf](https://www.noeccn.org.uk/resources/Documents/Transfer%20Group/Transfer%20resources%20and%20documents/ACC%20Transfer%20Checklist%20and%20Observation%20Chart%2001_19.pdf)

## Appendix 1: Management of the Head Injured Patient



**Figure 1** Summary of recent evidence-based recommendations for the management of traumatic brain injury (TBI).

Wiles, Management of traumatic brain injury Anaesthesia 2022, 77 (Suppl. 1), 102-112

- All patients in this category should be considered as 'High Risk' NoECCN Transfer Risk Assessment. This means they require transfer with a transfer competent practitioner and a Doctor/ACCP with Critical Care and advanced airway competencies.
- With this in mind, there should be a low threshold for the intubation of these patients, particularly if TBI has been radiologically confirmed. Absolute indications for intubation are listed below
- The following recommendations were made in accordance to guidance from AAGBI<sup>1</sup> and Brain Trauma Foundation<sup>2</sup>.

### Absolute Indications for Intubation

- GCS ≤ 8
- Significantly deteriorating conscious level (Fall in GCS >2 or fall in Motor score of ≥1)
- Loss of protective laryngeal reflexes
- Failure to achieve PaO<sub>2</sub> ≥ 13 kPa;
- Hypercarbia (PaCO<sub>2</sub> > 6 kPa)
- Spontaneous hyperventilation (PaCO<sub>2</sub><4kPa)
- Bilateral fractured mandible
- Copious bleeding into the mouth
- Seizures\*

Prior to all intubations, GCS and Pupil reactions should be documented

Induction - Primary concern during induction is to minimise hypotension. RSI should be used in all trauma patients. Below is an advisory guide:

- Ketamine (1-2mg/kg)
- +/- Fentanyl (3-5µg/kg)
- Rocuronium (1mg/kg)

\*Seizures should be treated with IV antiepileptics (Recommend Levetiracetam 30mg/kg – max 3g)

### Monitoring

Minimum physiological monitoring required for transfer\*:

- EtCO<sub>2</sub>
- BP (Ideally IBP)
- ECG
- SaO<sub>2</sub>
- Urine Output
- Temp
- Clinical monitoring
- GCS, Pupils

Targets for physiological parameters:

- PaO<sub>2</sub> > 13kPa\*
- PaCO<sub>2</sub> - 4.5-5.0kPa\*\*
- SBP – 110-150, MAP > 90mmHg
- Temp – 36-37 °C
- BM – 6-10 mmol/L

\*Continuous EEG monitoring may be of benefit, but establishing/acquiring it should not delay transfer.

+ Estimates should be made between SO<sub>2</sub>-PaO<sub>2</sub> and EtCO<sub>2</sub> - PaCO<sub>2</sub> prior to transfer. If this is not possible, aim SO<sub>2</sub>>94% and EtCO<sub>2</sub> = 4.0-5.0 kPa

\*\*Hyperventilation as treatment for raised ICP is justifiable for short term use if impending uncal herniation suspected, in combination with other treatments (Mannitol/hypertonic saline)

### Sedation and Ventilation

Sedation should be maintained through TCI of appropriate agent (Recommend: Propofol + Alfentanil/Remifentanyl). Aim of sedation is to give appropriate BP control and reduce events that may increase ICP (Coughing/breath holding etc). So target of sedation should be deep (RASS -5)

Volume control ventilation is first choice, to control PaCO<sub>2</sub>. Pressure control modes may be used but require constant monitoring and suitable alarms

- Ventilation Parameters
- VT = 6-8 ml/Kg, PEEP 5-10cmH<sub>2</sub>O

Other measures to prevent raised ICP that should be taken:

- No neck ties
- Head central and neutral, with 30 degree elevation (if possible)
- Avoid IJ CVC
- Avoid collar if C-spine immobilised

1 - Nathanson, M.H. et al(2020), Guidelines for safe transfer of the brain-injured patient: trauma and stroke, 2019. Anaesthesia, 75: 234-246.  
 2 - Carney N, et al. Guidelines for the Management of Severe Traumatic Brain Injury, Fourth Edition. Neurosurgery. 2017 Jan 1;80(1):6-15

**Appendix 3: NEAS Transfer Request Proforma**



Adult Critical Care R1 Transfer Request Proforma	
Patient name	
Patient Number	
Consultant Requesting transfer	
<b>Identify and confirm bed with receiving hospital and receiving Consultant</b>	
Hospital:	
Unit:	
Consultant:	
<b>When the patient is stable on the transfer trolley inform NEAS that you need a Critical Care transfer:</b>	
0191 4143144	
<b>"This is a Critical Care Transfer using the Transfer Trolley requiring a R1 response. A paramedic crew is not required"</b>	
Dispatch NEAS job number:	
Time:	
Person Requesting Ambulance	Name:
Operator	Name:
Referring Department	
Picking up point	
Receiving Hospital	
Receiving Department	
Name of Patient	
Principle diagnosis	
Who is accompanying the patient.	
How much Oxygen is required	
Ambulance Arrived:	Time:
<b>Ambulance Delayed – Follow-up Calls</b>	
Time:	
Person Requesting Ambulance	Name:
Speak to Duty Manager	Name:
<small>Problem - ETA</small>	
Time:	
Person Requesting Ambulance	Name:
Operator	Name:
<small>Problem - ETA</small>	

**Appendix 4: Guideline Poster “Management of Trauma Patients with GCS  $\leq 13$ ”**

See website.