Inter-Hospital Transfer of the Critically Ill Adult with Acute Brain Injury in Greater Manchester

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Division/Department	Division of Tertiary Medicine & Critical Care
Applies to	All NHS staff within Greater Manchester Critical Care Network hospitals involved in the time-critical transfer of the critically ill adult with acute brain injury into Salford Care Organisation, Northern Care Alliance NHS Foundation Trust
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QUICK REFERENCE GUIDE for TIME CRITICAL Transfers

Guidelines guide, clinicians decide

- If the patient is pregnant read this – there are **no obstetric services at Salford**
- Patients aged 16 or older are normally treated at Salford

Carry out the following **Clinical** and **Logistical** actions **simultaneously**

Clinical

Key Points

Avoid hypoxia. Avoid hypotension. If in doubt intubate prior to transfer.
Limit time-expensive interventions. Avoid additional imaging unless it will change management in referring centre or during transfer.
Click relevant subheading to link to detailed guidance.

Airway

- Document pre-induction GCS (including components) and pupillary reactivity.
- **In trauma, immobilise & image c-spine ± whole spine if spinal injury known or suspected** – see here.
- Secure endotracheal tube in a way that does not obstruct cerebral venous drainage (tie or tape).

Breathing

- **Avoid hypoxia, aim normoxia and maintain $PaCO_2$ 4.5 – 5.0kPa.**
- Note the end tidal - arterial CO_2 gradient to allow ongoing optimisation – it is often higher than expected.
- Prioritise neuroprotection over lung protective ventilation.
- If concern for worsening ICP or brain herniation, target $PaCO_2$ 4.0-4.5kPa as part of rescue therapy.

Circulation

- **Avoid hypotension, maintain MAP ≥90mmHg, avoid severe hypertension (SBP ≤ 160-180mmHg).**
- Where time permits (in ischaemic stroke particularly) tailor BP to pathology-specific parameters.
- **An arterial line is recommended**.
- CVC insertion is time-expensive: **only insert CVC if no alternative.**
- Haemodynamic management can be complex – patients are often hypovolaemic at presentation – ensure fluid resuscitated as appropriate to euvolaemia in addition to vasopressors (if required).
- Patients with trauma associated brain injury who remain hypotensive despite resuscitation should not be transferred until the cause identified and the patient suitably stabilised for transfer.

Disability

- **Monitor pupil size and reactivity regularly** – eyelids should not be taped shut.
- Look for and **treat seizures**. Benzodiazepines are first line treatment. IV levetiracetam can be used second line (dose here).
- Maintain strict neutral alignment of head, neck and thorax to promote cerebral venous drainage.
- Maintain normothermia. Avoid hypoglycemia.

If signs of worsening ICP ± Brain herniation: click here
Development of a dilated, unreactive pupil in one or both eyes, particularly if associated with hypertension and bradycardia, suggests impending coning

Other important considerations

- Identify anticoagulant use, coagulopathy and thrombocytopenia prior to transfer.
- If intracranial bleeding **warfarin must (almost always) be reversed in the referring hospital.** Wherever possible **DOACs should also be reversed prior to transfer,** following local protocols.
- Significant coagulopathy and thrombocytopenia should be corrected as soon as possible. Transfer to Salford should not normally be delayed awaiting blood products. See here for detailed advice.
- In **trauma**, perform a focused **secondary survey** to identify other major injuries.

QUICK REFERENCE GUIDE for TIME CRITICAL Transfers

Guidelines guide, clinicians decide

Logistical

Key Points

All patients requiring immediate lifesaving neurosurgery must be admitted to their local neurosurgical centre irrespective of initial availability of neurocritical care beds. Discuss with NWAS early once decision to transfer has been made to avoid transport delays. Arrange transfer process simultaneously with clinical management.

Preparation for transfer

- Urgent conversations should occur via telephone, not solely via Patient Pass.
- Decision to transfer is the **joint responsibility of referring and accepting hospital consultants.**
- Patients must have a **named accepting consultant prior to transfer** – e.g., Neurosurgical Consultant on call. In Major Trauma patients, Trauma Team Leader (TTL) to TTL transfers should occur in accordance with established guidelines relating to the major trauma service. For further TTL and trauma network pathways see appendix 4 and trauma network transfer guidelines here.
- **Immediately prior to departure call Salford Royal Hospital Emergency Department Resus on 0161 2062877** to inform them of your departure and expected arrival time.
- For suggested medications to prepare/source for transfer, click here.

Documentation

- A **risk assessment** must be completed.
- An appropriate **checklist**, e.g., the GM CCN interhospital transfer checklist should be used.
- The transfer should be documented using the GM CCN transfer form.

NWAS

- Communicate with NWAS using the **NWAS Healthcare Professional line: 0345 140 0144.**
- Time critical transfers of critically ill patients with acute brain injury **must be triaged as interfacility level two** - an NWAS clinician is available on the Healthcare Professional line to assist.
- Utilise ambulance O2 and power supplies whenever able.

If deterioration occurs during transfer

- Expedite transfer to Salford.
- Ask ambulance crew to update Salford Royal Emergency Department that 'the patient they are expecting has clinically deteriorated during transfer' to ensure Salford Royal ED teams are prepared to assist on arrival.

Arriving at Salford Care Organisation

- All patients must present initially to the Salford Royal **Emergency Department** for registration
- Responsibility for care transfers to the relevant Salford team on completion of handover

Useful contacts

- Patient Pass: **patientpass.srft.nhs.uk**
- **Salford Care Organisation Switchboard: 0161 789 7373**
- Salford Policies and Guidelines: **www.northerncarealliance.nhs.uk/our-policy-hub**

Management of Impending Coning

(Clinical suspicion of brain herniation/life threatening intracranial pressure rise)

Development of dilated unreactive pupil(s), particularly with associated hypertension and bradycardia, suggests impending coning.

If **already in transit**, alert ambulance staff and expedite transfer to Salford. Ask NWAS crew to contact the Salford Royal Emergency Department and inform that the patient has deteriorated, to allow the Resus department to prepare in advance of arrival.

Staff must remain seated during transfer. If it is necessary to attend to the patient during transfer the vehicle must first be stopped in a safe place.

Once a decision has been made to transfer to Salford Royal, this is extremely unlikely to be reversed. Transfer should not be delayed for the purpose of re-contacting the accepting neurosciences team. This can be done en route as time permits.

The following actions should be carried out in a stepwise approach in an intubated patient:

Actions

- **Head up to 30 degrees**. If spine immobilised, carefully **sit up at hips** on transfer trolley, keeping spine otherwise in alignment, and taking additional care if lumbar spine or pelvic injury suspected/proven.
- Ensure **no obstruction to cerebral venous drainage**, e.g., avoid tight endotracheal tube ties.
- **Neck in neutral alignment** (in both sagittal and coronal planes).
- **Remove cervical collar,** if present, whilst maintaining other spinal precautions.
- Ensure adequate **sedation, analgesia and neuromuscular blockade.**
- Ensure **normoxia.**
- **Hyperventilate to $PaCO_2$ 4.0-4.5kPa** – avoid high airway pressures, breath stacking and high PEEP.
- Ensure **MAP at least 90mmHg**: arterial line should be zeroed at level of tragus of ear in traumatic brain injury.
- **Hypertension is likely due to high intracranial pressure** – the first priority is to lower intracranial pressure, not treat with antihypertensives.
- Look for and treat **seizures**, e.g., IV midazolam 5-20mg, levetiracetam (dose here).
- **Osmotherapy** – mannitol 0.5g/kg ideal body weight (IBW) as IV bolus (e.g., 350mls 10% mannitol for 70kg IBW patient, infused over 15 minutes) – prepare to manage diuresis), or 'hypertonic saline' (2ml/kg IBW dose of 2.7% sodium chloride infused over 15 minutes) through CVC (if present) or a reliable peripheral venous cannula.
- **Thiopentone** 125mg boluses up to 500mg – actively manage resultant haemodynamic instability.

1. Overview

This document summarises best practice with regards to inter-hospital transfer of the critically ill adult with acute brain injury in Greater Manchester.

If you have any concerns about the content of this document, please contact the author or advise the Document Control Team.

2. Scope

This guideline is for use by all staff involved in the resuscitation and inter-hospital transfer of critically ill adults with acute brain injury in Greater Manchester. This includes medical, nursing and allied health professionals in critical care, emergency departments and anaesthesia at acute hospitals across the region.

It applies when the adult patient is both:

- Critically ill, defined as requiring (or at risk of requiring) a level of care that is greater than that normally provided on a standard hospital ward, or by a paramedic-crewed ambulance, and therefore requires escort by local critical care or anaesthetic staff.
- For urgent transfer to tertiary neurosciences services at Salford Care Organisation.

These patients typically have one of the following conditions: traumatic brain injury, subarachnoid haemorrhage, hydrocephalus, acute ischaemic stroke requiring neurosurgical or neuroradiology intervention (e.g., consideration of decompressive craniectomy or mechanical thrombectomy), spontaneous non-aneurysmal intracerebral haemorrhage or intracerebral lesions such as abscess or malignancy requiring neurosurgical intervention.

This guideline **does not apply** to the following groups:

- **Children**. Children under the age of 16 are cared for at Royal Manchester Children's Hospital (RMCH). Young people aged 16-18 may be cared for at RMCH if they are previously known to RMCH; their care should be discussed with colleagues at RMCH. Young people aged over 16 who are not known to RMCH are normally cared for at Salford. Any person under 18 years of age who dies unexpectedly must be referred for Sudden Unexpected Death in Childhood investigation.
- **Pregnant patients with gestational age >20 weeks.** There are no obstetric services on the Salford Royal site. Patients who are pregnant with a gestational age of 20+0 weeks or greater who require neurosurgical inpatient care should generally be referred to a neurosciences centre with a co-located maternity service – the neurosurgical service at Salford can advise. In rare instances, for immediately life-threatening emergencies, on the express advice of the Salford Royal neurosurgeons, such patients may be transferred to Salford Royal for life saving surgery, prioritising the patient over the fetus. The care for pregnant patients with stroke is more context-specific and should be discussed with the stroke consultant at Salford Care Organisation. Similarly the care for pregnant patients on the major trauma pathway is also context-specific, and should be discussed between senior clinical decision makers including trauma team leaders and the relevant neurosciences teams, noting published Greater Manchester major trauma pathways. Pregnant patients with a gestational age less than 20 weeks are cared for at Salford with input from gynaecology.

In case of any uncertainty the advice of the relevant neurosciences team should be sought.

Guidelines guide, clinicians decide

The recommendations in this guideline represent the views of the named multidisciplinary authors, taking into account careful consideration of the evidence and national guidance available, and with additional input from those named in section 10. **It does not replace clinical judgement.** We recognise that the evidence base for guiding practice in this area is limited; many of these recommendations are based on expert opinion and consensus for best practice. It is not mandatory to apply these recommendations, and this guidance does not override the responsibility of transferring teams to make decisions appropriate to the circumstances of the individual, in consultation with them and their advocates.

In case of any uncertainty, the advice of the relevant neurosciences team can be sought, although this can be time expensive. Alternatively, the treating clinician may decide that the balance of risks and benefits justifies transfer without further discussion. For all transfers where there is an element of uncertainty, we encourage prospective and thorough documentation in the medical record to clarify the rationale behind any time critical decisions made, and to ensure a clear chain of accountability.

Associated Documents

Several published national and regional guidelines already provide guidance on management and transfer of this patient group. In preparing this guideline we acknowledge and utilise these works to help create a document tailored to the established pathways and patient population of the Greater Manchester region. Such works include:

- Association of Anaesthetists & NeuroAnaesthesia and Critical Care Society's 'Safe transfer of the brain injured patient' guideline[1]
- The Faculty of Intensive Care Medicine & Intensive Care Society's 'Guidance on the transfer of the Critically Ill Adult'[2]
- North West Critical Care & Major Trauma Operational Delivery Networks: Standards & Guidance: Intra and Inter-Hospital Critical Care Transfers (Adult Patients) Guideline[3]
- Faculty of Intensive Care Medicine's Guidelines for the Provision of Intensive Care Services (v2.1)[4]
- National Institute for Health and Care Excellence. Head injury: assessment and early management NG232[5]

Major Trauma patients

This guideline includes advice on the care of critically ill adult patients with acute brain injury associated with trauma, but does not seek to replace or supersede existing Greater Manchester Major Trauma Network pathways and guidance which should be referred to when relevant. TTL to TTL transfers should utilise the Greater Manchester Major Trauma TTL Transfer checklist (see appendix 5).

3. Background

Acute brain injury is a common cause of critical illness in the adult population. There have been significant changes in the management of these patients in recent years with the introduction of major trauma centres and therapeutic advances in stroke management. Patients with traumatic brain injury have improved survival when cared for in specialist neurosurgical units even if they do not require surgical intervention.[6] In Greater Manchester specialist neurosciences inpatient care is provided by the Salford Care Organisation (at Salford Royal Hospital).

Many patients are diverted directly to Salford by the ambulance service; however this is not always appropriate or possible: patients may arrive in non-neuroscience acute hospitals and require subsequent transfer to Salford. Transfer typically occurs in the early/resuscitative phase of illness, often out of hours, and may be time critical. These transfers must be undertaken with great care to avoid causing secondary brain injury and worsening neurological outcome. Pre-hospital diversion of patients to neurosciences centres improves access to specialist care for some patients but reduces familiarity in caring for these critically injured patients at non-neurosciences hospitals.

4. What is new in this version?

New document.

5. Guideline

5.1 Decision making and responsibility for transfer

The decision to undertake inter-hospital transfer of a critically ill adult with acute brain injury must be made by appropriate consultants in both referring and receiving hospitals, who take joint responsibility for the transfer. Appropriate senior nursing staff should be involved at both sites. This includes the decision as to whether a patient is, or is at risk of becoming, critically ill and so whether requires escort and interventions as outlined by this guideline.

Patients must be accepted for transfer to Salford by an appropriate named neurosciences consultant. Patients with major trauma should be transferred according to major trauma pathways, and therefore have been accepted by the Trauma Team Leader.

Referrals may be made via Patient Pass (for neurosurgery and neurology: patientpass.srft.nhs.uk), or via telephone in time critical situations. The Salford switchboard number is 0161 789 7373. It is important that when telephone conversations have taken place these are appropriately documented as contemporaneously as possible e.g., on Patient Pass.

All patients requiring immediately lifesaving neurosurgery must be admitted to their local neurosurgical centre irrespective of initial availability of neurocritical care beds.[4] In non-time critical situations availability of critical care capacity should be discussed with the critical care consultant or their delegate prior to accepting the patient for transfer.

Additional imaging should normally only be performed once the patient has arrived in Salford, unless repeat imaging is expected to impact the decision to transfer. The attending consultant at the referring hospital remains primarily responsible for the patient in their care and may decide not to transfer the patient. It is their responsibility to ensure that an appropriate risk assessment has been carried out and documented.

The accepting clinician at Salford must communicate the urgency of the transfer to the referring team e.g. ‘This is an emergency inter-facility level 2 transfer for time-critical management’. This is used to assist in determining the response time provided by the ambulance service as outlined below. It may also impact which resource is allocated e.g., dual-paramedic, paramedic-technician, technician-technician, other. This is important in time-critical brain pathologies where ***hospital medical escort is not required***, for example patients with anterior circulation acute ischaemic stroke do not normally require a medical escort but will require experienced ambulance crew. Patients with malignant middle cerebral artery syndrome and posterior circulation strokes are at high risk of deterioration; hospital clinician escort is likely to be required.

Although no precise time limit is set for transferring a patient with brain injury requiring emergency intervention, a maximum of four hours from injury to surgery is recommended.[1] The sooner the expanding mass lesion is controlled, the better for the patient.

The SCO accepting clinician must tell the referring team where to take the patient (i.e., the Emergency Department) and inform Emergency Department staff of the patient's expected arrival and planned destination. For non-trauma transfers the relevant accepting neurosciences team should contact the Emergency Department consultant on call (non-trauma) on extension 68682. For trauma patients transferring under neurosurgery, the Trauma Team Leader (TTL) (extension 62226) must be informed.

Arrival at the Emergency Department allows registration and admission onto the electronic patient record to smooth the onwards journey through the hospital. The accepting clinician must additionally alert critical care, anaesthesia/theatres and radiology (as appropriate) of the transfer.

The patient should be handed over to the receiving team as soon as possible after arrival in Salford Royal Hospital, either in the Emergency Department or Critical Care Unit. The transferring team must not be asked to provide ongoing care in Salford, e.g., take the patient for a CT scan or to theatre. The patient remains the responsibility of the transferring team until formal handover to the receiving team post-transfer has been completed.

If another shared-care (parent) team is involved in the care of the patient, that team must also be involved in the organisation of the transfer and the equivalent team at Salford should accept the patient prior to transfer. In time critical situations it may be necessary to do this following transfer, assuming to do so does not negatively impact on the patient's care.

5.2 Staff

A critically ill patient with acute brain injury must be transferred by a clinician with suitable capabilities and experience in such transfers. They should be able to independently initiate, administer and modify pharmacology, physiology and lung ventilation to minimise secondary brain injury. They should be competent to perform drug assisted tracheal intubation in transfer if the situation requires it.

If there is any uncertainty as to whether a patient with acute brain injury is critically ill (e.g., requires or is at risk of requiring interventions such as intubation, organ support, medical escort), a critical care opinion should be sought. All patients accepted for transfer by neurosurgery who have a Glasgow Coma Score less than 15, or are at risk of deteriorating, should be assessed prior to transfer by a suitably experienced critical care or anaesthetic practitioner (with capability to transfer a critically ill patient with acute brain injury).

A dedicated trained assistant, such as a nurse or operating department practitioner with appropriate capabilities must also accompany the patient.

Access to consultant advice, by mobile phone or equivalent, is essential.

5.3 Preparing for transfer

This section outlines general considerations when preparing the critically ill adult with acute brain injury for transfer. Pathology specific advice can be found in section 5.6.

An appropriate transfer checklist, such as the Greater Manchester Critical Care Network Inter-Hospital Transfer Checklist, or the Greater Manchester Major Trauma Network Transfer Checklist (for TTL to TTL transfers) must be used.

Every patient must have a risk assessment prior to transfer.

Meticulous resuscitation and stabilisation of the patient prior to transfer is important, to avoid physiological disturbance associated with movement and reduce the risk of deterioration during the journey. Although transfer is often urgent, resuscitation and stabilisation should be underway before transfer. Transfer of patients with hypoxia or hypotension should be avoided until these have been corrected.

If the transferring team have not been involved in the prior care of the patient, they must take time to familiarise themselves with the patient. A full clinical assessment including physical examination should be performed and documented.

Minimum standards of patient monitoring are:
- Continuous observation.
- Cardiac rhythm (ECG) monitoring.
- Blood pressure.
- Oxygen saturation.
- End tidal carbon dioxide (waveform) in intubated patients.
- Temperature.
- GCS (including components), pupillary size and pupillary response to light.
- Ventilator parameters, flows, pressures and volumes (in intubated patients).

Intubation

Patients with any of the following should be intubated prior to transfer:
- Glasgow Coma Score (GCS) 8 or less, or a deteriorating conscious level, e.g., fall in GCS of two points or more, or a fall in motor score of one point or more.
- Unable to achieve adequate oxygenation or carbon dioxide targets, e.g., unable to maintain $PaCO_2$ 4.5-6.0kPa in a spontaneously ventilating patient.
- Airway soiling or reduced/absent airway reflexes.

It is safer to intubate a patient in a hospital, rather than in an ambulance.

In situations of uncertainty, often the benefit of the doubt favours intubation and subsequent neuroprotection prior to departure. Consideration should be given to anticipated ease of intubation and risk of deterioration (as evidenced either clinically or radiologically e.g., seizure activity or the presence of hydrocephalus on CT imaging). If a decision is made to transfer the patient unintubated, a team capable of performing emergency intubation in a patient with acute brain injury should accompany the patient. If uncertainty exists about the expected/typical clinical time course of a particular pathology or CT appearance, then advice from the accepting neurosciences team, or Salford Critical Care medical team can be sought.

Intubating a critically ill adult with acute brain injury:

Maintaining haemodynamic stability and avoiding hypoxia during intubation is essential to minimise secondary brain injury.

- **Document GCS** (including a breakdown of component parts) **and pupil size/reactivity** prior to induction.
- A **pre-induction arterial line is useful** to assist in maintaining haemodynamic stability. In traumatic brain injury the **transducer should be zeroed at the level of the tragus**. If non-invasive blood pressure monitoring is used it should measure at one minute intervals during the peri-induction period. Blood pressure targets are discussed below.
- Patients may have poor respiratory effort so gentle bag mask ventilation may be required for adequate pre-oxygenation.
- An **intravenous induction agent, opioid and neuromuscular blocking agent** should be used, as recommended by national guidance for transfer of patients with acute brain injury. It is acknowledged that in some circumstances opioid availability may influence practice, particularly in time critical situations.
- **Ketamine is not contraindicated** by acute brain injury or status epilepticus. **Ketamine should be considered for its favourable haemodynamic effects**.
- The dose of induction agent should be modified in unstable patients.
- Use airway equipment with which you are familiar.
- An **endotracheal tube with subglottic suction is preferred**.
- Risk of aspiration of gastric contents should be considered and managed.
- **Manual in-line stabilisation is recommended when cervical spinal injury is known or suspected** (all patients with traumatic brain injury requiring intubation). Management of the intubated patient with suspected or confirmed spinal injury is covered here.
- The **endotracheal tube should be secured in a way that avoids obstruction of cerebral venous drainage**; ties or similar can be used provided they can be secured in a way that protects the airway but does not impede cerebral venous outflow.
- Following intubation most patients should be positioned with their head in strict neutral alignment, 30 degrees head up, without hyperextension/flexion of the neck, to optimise cerebral venous drainage and promote optimal cerebral blood flow. In patients with suspected or confirmed spinal injury, follow the advice outlined here.

Respiratory considerations

Even short periods of hypoxia are associated with secondary brain injury and must be avoided if possible. There is also growing evidence of harm due to hyperoxia. Normoxia should be the aim.[1,5] PEEP should normally be used to prevent atelectasis; up to 10cmH_2O can be used without adverse effect on cerebral perfusion.[1]

Ventilation should be adjusted to maintain $PaCO_2$ 4.5-5.0kPa. If there is clinical or radiological evidence of raised intracranial pressure with impending herniation, mild hyperventilation to $PaCO_2$ of 4.0-4.5kPa, together with expedition of transfer and escalated tiered management is appropriate. It is useful to note the $ETCO_2$-$PaCO_2$ gradient to help guide ventilation during transfer.

Clinically significant pneumothoraces should be drained prior to departure. Neurogenic pulmonary oedema can feature in acute brain injury: this should be managed with ventilatory strategies – diuretics should be avoided as the resulting hypovolemia can significantly impair cerebral blood flow.

Cardiovascular considerations and blood pressure targets

	Traumatic Brain Injury	Subarachnoid Haemorrhage	Acute ischaemic stroke	Spontaneous non-aneurysmal intracerebral haemorrhage
Blood Pressure Targets	MAP ≥90mmHg	MAP 90mmHg And SBP <180mmHg (MAP 80-90mmHg acceptable)	Transfer for mechanical thrombectomy (not for thrombolysis): BP < 220/120 mmHg Thrombolysis received or being considered: SBP <185mmHg DBP <110mmHg Maintain normoxia and cerebral perfusion (MAP ≥90mmHg)	Priorities: 1. Reverse anticoagulation 2. Expedite transfer to Salford 3. Maintain normoxia and cerebral perfusion (MAP ≥90mmHg) 4. Thereafter, consider control of SBP >160-180mmHg: lower to target 130-160mmHg but ***do not delay transfer*** (see below)

Hypotension is strongly associated with harm and risks secondary brain injury. An arterial line is strongly preferred for safe transfer of the critically ill adult with acute brain injury for both haemodynamic and gas exchange monitoring. It also uses significantly less battery life on transfer monitoring devices than automated pneumatic non-invasive blood pressure devices.

A patient who remains hypotensive despite resuscitation should not be transported until the cause has been identified and the patient stabilised where possible. In general, correction of major haemorrhage takes priority over transfer. Persistent hypotension will adversely affect

neurological outcome. Vasodilatation due to sedation, cardiac complications of neurological injury and hypovolaemia due to diabetes insipidus are other possible causes of hypotension in this patient group. Patients with brain injury will often be hypovolemic on presentation and therefore fluid resuscitation to euvolemia is essential alongside vasopressor use.

Persistent hypertension may be due to worsening neurological status or inadequate sedation. Hypertension can usually be managed with increased sedation. Intravenous antihypertensives are rarely required in this setting; if they are used care must be taken to ensure adequate cerebral perfusion is maintained.

BP considerations in spontaneous non-aneurysmal intracerebral haemorrhage[9, 10, 13]

NICE guidance (NG128) suggests patients presenting within 6 hours of onset with a SBP 150-220mmHg should be considered for 'rapid BP lowering' to SBP 140mmHg, provided the total drop in SBP is <60mmHg in the first hour of treatment.[7] European Stroke Organisation consensus is that the SBP decrease should be <90mmHg from baseline values in the first 12 hours of treatment.[8] For patients presenting after 6 hours these BP targets are different, and additional advice is available from both on call stroke services at Salford and NCA guidelines.[22]

Rapid BP lowering should not however be used in patients who:[7]

1. Are being transferred for clot evacuation.
2. Have a GCS <6.
3. Have an underlying structural disease (e.g., tumour, AVM, aneurysm).
4. Have massive haematoma with a poor expected prognosis.

Many patients transferred under this guideline will meet one or more of these exclusion criteria. Urgent transfer with intravenous blood pressure lowering therapy can risk precipitating hypotension and subsequent harm from hypoperfusion.

On balance, clinical priorities in this patient group are:

1. Actively seek out and reverse anticoagulation.
2. Transfer in the shortest time safely possible.
3. Focus on maintaining a cerebral perfusion pressure (i.e., avoid hypotension).
4. Where time and clinical situation permits, thereafter consider BP lowering therapies (IV labetalol, or IV glyceryl trinitrate if beta blockade contra-indicated). These can be used if target is not achieved by IV sedation in the intubated patient alone, titrated to the targets in the table above.

Where doubt exists, seek advice from the on call accepting neurosciences team.

Neurological considerations

Secondary brain injury occurs as a consequence of cerebral hypoxia due to either reduced oxygen supply (e.g., raised intracranial pressure, hypotension or hypoxia), or increased oxygen demand (e.g., seizures or hyperthermia).

Intubated patients should be sedated, receive opioids routinely, and receive neuromuscular junction blocking agents when required (e.g., to avoid coughing). The cervical spine should be in neutral alignment, with no obstruction to cerebral venous drainage. Patients should be sat up to 30 degrees unless contraindicated. Temperature should be monitored and managed, aiming for normothermia (36.0-37.5°C). Hypoglycaemia must be avoided.

If the patient has a seizure, load with antiepileptic medication (in addition to any benzodiazepines used as rescue) prior to transfer. In time critical situations **IV levetiracetam** offers ease of administration and is initiated with a loading dose of 60mg/kg ideal body weight (to a maximum of 4.5g) diluted in at least 100mls 0.9% sodium chloride or 5% glucose and infused over 10 minutes.

Pupil size and reactivity should be assessed and documented regularly during the transfer process.

If signs of worsening ICP ± Brain herniation: click here

Development of a dilated, unreactive pupil in one or both eyes, particularly if associated with hypertension and bradycardia, suggests impending coning

Additional considerations

Central venous catheterisation (CVC) is rarely needed prior to transfer of the critically ill adult with acute brain injury. Certain vasopressors and osmotherapy agents can be safely delivered peripherally (e.g., metaraminol, mannitol). CVC insertion risks delaying definitive care. Trendelenburg positioning risks worsening intracranial hypertension. At least two secure peripheral venous cannulae are recommended, one of which should be wide bore.

A gastric tube may be useful in the early resuscitative phase to decompress the stomach, which may reduce intra-cranial pressure and aid ventilation. This should be done prior to transfer if there is evidence of raised intra-abdominal pressure. Otherwise, a gastric tube can be inserted in Salford. The oral route must be used if there is suspicion for fractured base of skull.

A urinary catheter is often useful to guide fluid resuscitation and important in cases where e.g., mannitol is used, but insertion must not delay a time critical transfer.

Management of anticoagulation, coagulopathy and thrombocytopenia

A prompt history (including collateral and medical record review) should be taken to identify the use of anticoagulant and antiplatelet drugs. These medications should be stopped immediately.

A full blood count, coagulation screen and group and save sample should be sent to the laboratory as soon as possible after recognition of acute brain injury, in the referring hospital.

In patients with acute intracranial haemorrhage and any warfarin use in the last 5 days, **warfarin must (almost always) be reversed immediately in the referring hospital.** In exceptional circumstances the risks of reversal of anticoagulation may not outweigh the benefits, e.g. a small stable subdural haematoma in a neurologically well patient with a metallic mitral valve, who may be critically ill for another reason.

In patients with acute intracranial haemorrhage and any **direct oral anticoagulant (DOACs) use in the last 24 hours, mitigate any coagulopathy through use of prothrombin complex concentrate and reverse dabigatran**, following local protocols.[23]

In patients with acute intracranial haemorrhage and any **low molecular weight heparin (LMWH) use in the last 12 hours, reverse immediately using protamine**.

Significant coagulopathy (INR >1.5, fibrinogen <1.5g/L) and thrombocytopenia (platelets <100 x 10^9/l)[11] should be urgently corrected in patients with acute intracranial haemorrhage – this is often the most urgent therapeutic intervention. Appropriate blood components should be requested as an emergency in this setting and administered as soon as possible. Haematology advice should be sought.

Transfer should not normally be delayed awaiting blood products. Most hospitals in the region do not have platelets available for immediate issue: this is not the case at Salford, where there are platelets and fresh frozen plasma immediately available.

Patients should not normally be transferred with blood components unless transfusion has already commenced. If it is essential that blood components are transferred with the patient, the blood transfusion laboratory must be involved early, so necessary arrangements can be made to minimise waste and ensure legal obligations regarding traceability are met.

Antiplatelet drugs should be withheld, but platelet transfusion in people using antiplatelet medications *but without thrombocytopenia* may be harmful and should be avoided.[12]

Management of patients with acute brain injury who are anticoagulated, coagulopathic or thrombocytopenic can be challenging, particularly in time critical situations. The advice of the relevant neurosciences team can be sought by telephone, but this can be time expensive. The treating clinician may decide that the balance of risks and benefits justifies transfer without further discussion. In such circumstances, we encourage prospective and thorough documentation in the medical record to clarify the rationale behind any time critical decisions made, and to ensure a clear chain of accountability.

Preparing equipment

The patient should be transferred using appropriate transfer equipment in keeping with general transfer of the critically ill adult guidance. Sufficient oxygen (at least twice the anticipated consumption) and electrical supply (e.g., sufficient battery supply and equipment to utilise the ambulance power supply) should be arranged.

Drugs and blood for transfer

An adequate supply of essential drugs must be taken, with additional supplies for unanticipated delays. This should include pre-calculated doses of medications used in cases of clinical deterioration such as those outlined here. Such medications include:

- Intravenous sedation, such as propofol and midazolam.
- Neuromuscular blocking agents.
- Opioid analgesics, which (as with midazolam, where applicable) must be handled in accordance with the referring hospital's controlled drug policies and procedures[1]
- Anticonvulsants, such as benzodiazepines or thiopentone, and an antiepileptic drug, such as levetiracetam.
- Osmotherapy, such as mannitol or hypertonic sodium chloride.
- Vasoactive drugs.
- Resuscitation drugs.
- Intravenous fluids, usually 0.9% Sodium Chloride.

Patients should not normally be transferred with blood components unless transfusion has already commenced and local policy permits. Referring hospital blood bank protocols must be followed in the case of ongoing transfusion during transfer.

Communication and documentation

Every effort should be made to communicate with the patient about transfer arrangements. Relatives should be kept informed at all stages of transfer. Care should be taken to ensure that relatives are aware that transfer is for ongoing specialist assessment and there should not be a promise of definite intervention due to the dynamic nature of acute brain injury. Separate transport arrangements for relatives should be explored whenever possible.

Copies of patient notes should be prepared. Where time permits, relevant electronic clinical records (e.g., clinic letters, medication reconciliation/summary) should be printed. In non-time critical situations the Greater Manchester Critical Care Network Handover for Interhospital Transferred Patient form should be completed in full and sent with the patient. The Greater Manchester Critical Care Network Inter-Hospital Transfer form must be used to document the transfer. The white copy of the form should be left in the patient's notes at Salford and the yellow copy returned to the network by the transferring team.

Requesting an ambulance

A NWAS ambulance should be requested by contacting the healthcare professional line on **0345 140 0144.** The call should be made by a clinician familiar with the situation and able to answer the call handler's questions. An NWAS clinician is available for advice and assistance; they can help better prioritise ambulance response time and should be consulted as necessary.

NWAS response times are triaged into categories. Most transfers of critically ill adults with brain injury are Interfacility Transfer (IFT) level two. In the event of a significant change in clinical condition requiring expedition of the transfer, NWAS must be recontacted.

The categories and associated target response times are included below to help guide discussion with NWAS to ensure appropriate categorisation:[17]

- **Life threatening emergency (IFT level one).** Immediate life-saving clinical interventions are needed from the ambulance service in addition to emergency transportation, e.g., cardiac arrest. *National mean target response time 7 minutes.*
- **Emergency (IFT level two).** Patients requiring immediate clinical care in another facility, e.g., time critical life, limb or sight saving intervention. Examples include patients going directly to theatre for immediate neurosurgery. *National mean target response time 18 minutes, 90% within 40 minutes.*
- **Urgent (IFT level three).** Patients who do not require immediate time critical intervention, but whose urgent needs cannot be met within their current facility. Response time not defined.
- **Non-urgent (IFT level four).** Not fulfilling any of the above descriptions. Response time not defined.

It is very unusual for critically ill patients covered in this guideline to be IFT level three or four.

Immediately before departure

A pre-departure checklist, such as that included in the Greater Manchester Critical Care Network Inter-Hospital Transfer Checklist, should be used to brief the team, including ambulance staff.

A member of the referring team should contact the accepting neurosciences team and **Salford Royal Emergency Department Resus (0161 2062877)** to update them on the patient's condition and provide an estimated time of arrival. This should not be the transferring team – they should focus on timely and safe departure.

5.4 In the ambulance

All portable equipment must be securely stowed to reduce the risk of injury in the event of an accident. Under no circumstances should equipment, e.g., syringe pumps, be left on top of the patient or trolley; they may become dangerous projectiles in the event of sudden deceleration.

Ambulance oxygen should be used during transfer. Ambulance oxygen cylinders must be checked prior to departure. Most NWAS ambulance vehicles are equipped with 2x F oxygen cylinders (2720 litres in total when full). All cylinders must be held in secure housings at all times.

The ambulance power supply should be used to preserve equipment battery life. Monitors must be clearly visible by the transferring team from their seated position.

Staff must remain seated at all times and wear seat belts provided. If it is necessary to attend to the patient during transfer, the ambulance crew should be informed and the vehicle stopped in a safe place before treatment is administered.

High speed journeys are not necessary in the majority of cases. They significantly increase the risk of an accident. Blue lights and sirens may be used to aid passage through traffic and deliver a smooth journey. The urgency of the transfer should be discussed with ambulance staff.

5.5 Arriving at Salford Care Organisation, Northern Care Alliance NHS Foundation Trust

An appropriate checklist, such as the GM CCN Inter-Hospital Transfer Checklist, should be used to facilitate safe and effective handover. A 'hands off' handover is recommended.

The accepting clinician should sign the GM CCN transfer form. The transferring clinician is responsible for ensuring this form is returned to the network. If there have been any issues in transfer these should be documented on the form and an incident report completed via the referring hospital's incident reporting system. It may be useful for the transferring team to discuss any issues with the responsible consultant on their return. At the end of the formal handover, the responsibility for ongoing clinical care transfers to the SCO clinical teams.

5.6 Considerations for specific patient groups

Traumatic brain injury

CT imaging should include the cervical spine, and where appropriate the whole spine should be imaged. Appropriate spinal precautions must be maintained in patients with a spinal injury, including manual inline stabilisation during intubation. The head should be maintained in neutral alignment to avoid obstructing cerebral venous drainage. See here for further information.

In isolated traumatic brain injury maintain a mean arterial blood pressure of at least 90mmHg.

Patients with trauma and acute brain injury who remain hypotensive despite resuscitation should not be transferred until the cause is identified and appropriate resuscitation has taken place. In general, stabilisation of major haemorrhage takes precedence over transfer. It is important that such measures are not omitted to expedite transfer as resultant complications may be impossible to deal with once the journey has begun. Persistent hypotension will adversely affect neurological outcome in traumatic brain injury. Permissive hypotension will similarly adversely affect neurological outcome and is therefore generally considered contraindicated in brain injury. In exceptional circumstances such a strategy may be required in major trauma patients with extra-cranial injury, however a senior clinician must be involved in this decision-making process and in the stabilisation and transfer of such patients.[1]

All trauma patients should undergo focused examination to identify significant extra-cranial injuries prior to transfer. Additional imaging should only be performed if it will change management in the referring centre or during transfer. Immediate stabilising management of significant extra-cranial injuries must occur prior to transfer (with consideration of the time critical nature of the brain injury). The accepting neurosciences team must be made aware of these at the point of referral/as soon as such injuries become identified.

Tranexamic acid use should be considered in polytrauma or traumatic isolated head injury. NICE recommends tranexamic acid use for isolated head injury in patients with a GCS of 12 or less in the first 2 hours following injury (NG232, 'Immediate management at the scene and transport to hospital').[5] Where signs of active extra-cranial bleeding exist (in the context of major trauma) tranexamic acid is recommended up to 3 hours following injury.[14] For both patient groups the total adult dose of tranexamic acid is 2 grams IV. In isolated head injury NICE recommends this as a single bolus, however other administration protocols exist outside of this indication.[5,15,16] Tranexamic acid is commonly administered by the ambulance service en route to the primary hospital – check for previous doses (and/or partial doses) prior to administering.

0.9% saline is the preferred crystalloid in critically ill patients with traumatic brain injury.[18]

Patients with open skull fractures or penetrating cranial injury may require antibiotics. The neurosurgical team can advise. Transfer should not be delayed for prophylactic antibiotic administration.

Intubated patients with suspected or proven spinal injury

Critically ill adults with traumatic brain injury are at high risk of co-existing spinal injury.

Relevant existing guidance relating to assessment, imaging and management (e.g. NICE NG41, NG232) should be followed.[5,19] The following points are not exhaustive.

Imaging

Patients aged 16 years or older with traumatic brain injury who have an altered level of consciousness or require intubation should undergo CT imaging of the cervical spine. Specific criteria are outlined in NICE NG232 section 1.6.[19]

Patients aged >16 years with blunt major trauma and suspected multiple injuries should be considered for whole body CT imaging as per established trauma guidelines. Patients aged >16 years with a GCS ≤14/15 with evidence of injury below the level of the clavicles should undergo CT whole spine imaging.[20]

Spinal precautions

In the **anaesthetised patient** whose predominant pathology is acute brain injury, where spinal immobilisation/precautions are required, the following is appropriate:

- Blocks and tape to support the cervical spine
- Neutral alignment of whole spine
- Reverse Trendelenburg/tilt of whole trolley (to optimise cerebral venous drainage)
- Log rolling

Cervical collars can obstruct cerebral venous drainage and may worsen intracranial hypertension: we do not recommend their routine use in addition to the above in anaesthetised patients whose predominant pathology is acute brain injury.[21]

It is beneficial, in terms of reducing intracranial pressure, for patients with traumatic brain injury to be sat up to 30 degrees. This conflicts with the flat position required for strict spinal precautions.

In critically ill patients with traumatic brain injury requiring time critical transfer, it is usually reasonable to carefully sit the patient up at the hips while maintaining other spinal precautions as above, if reverse Trendelenburg position cannot be achieved (most transfer trolleys in Greater Manchester cannot be placed in the reverse Trendelenburg position). Relative contraindications to sitting up include thoracolumbar spinal injury and pelvic fractures.

As described in the section 'management of impending coning', in the event of a clinical deterioration consistent with brain herniation or life threatening ICP rise, any cervical collar must be removed, and the patient sat up at the hips as a resuscitative measure; this prioritises cerebral perfusion over spinal precautions.

In patients with known spinal deformities, the spine should be kept in 'baseline' position.

Management of patients with acute brain injury and proven or suspected spinal injury can be challenging, particularly in time critical situations. The advice of the relevant neurosciences team can be sought by telephone, but this can be time expensive. The treating clinician may decide that the balance of risks and benefits justifies transfer without further discussion. In such circumstances, we encourage prospective and thorough documentation in the medical record to clarify the rationale behind any time critical decisions made, and to ensure a clear chain of accountability.

Subarachnoid haemorrhage

Subarachnoid haemorrhage is associated with significant haemodynamic instability. Hypovolaemia must be corrected. Patients are also at risk of myocardial dysfunction and may develop neurogenic pulmonary oedema.

Blood pressure management is critical in patients with SAH, particularly prior to treatment of the aneurysm. Swings in blood pressure and systolic blood pressure above 180mmHg must be avoided to reduce the risk of rebleeding. Cerebral perfusion must also be maintained, and hypotension avoided; MAP 80-90mmHg is appropriate.

Nimodipine should not normally be administered prior to transfer to Salford, as sourcing and administering is a time-expensive process. Vasospasm risk is low close to the ictus, and administration may precipitate haemodynamic instability en route. It may rarely be required e.g. late presentation subarachnoid haemorrhage on the express advice of the Neurosurgical team. If given, resultant hypotension should be anticipated and actively corrected as per earlier defined targets.

Spontaneous non-aneurysmal intracerebral haemorrhage

Patients with spontaneous non-aneurysmal intracerebral haemorrhage (ICH) being transferred under this guideline will typically have been accepted under neurosurgery at SCO, either as a primary referral, or following advice and input from stroke services.

Such patients (as with other brain injury types) are at risk of deterioration and requiring critical care support and intervention for transfer. Factors indicating those at greatest risk of neurological or respiratory deterioration, and thus more likely to require such intervention and escort include:

- GCS 8/15 or less, or those with a fall in score of ≥ 2 points or a motor score fall of ≥ 1
- Posterior fossa intracerebral haemorrhage, with/without brainstem signs
- Seizure activity
- Compromised airway or respiratory system

Around 10% of patients with spontaneous non-aneurysmal ICH are anticoagulated at presentation: anticoagulation should be rapidly reversed in the referring hospital (see above).

There is good evidence of benefit to early blood pressure lowering in specific patient groups with non-aneurysmal ICH. Critically ill patients with ICH tend to have larger bleeds and may have intracranial hypertension, so the need for blood pressure lowering must be balanced against the need to maintain cerebral perfusion pressure. The resultant guidelines are discussed earlier in this document.

Additional regional guidance on this topic is published by the Greater Manchester Stroke Operational Delivery Network.

Acute ischaemic stroke

Advances in stroke care, such as mechanical thrombectomy and decompressive craniectomy, have increased the number of patients with acute stroke who require to be transferred urgently to neurosciences centres. These treatments are time critical.

Most, though not all, patients with anterior circulation strokes do not require a medical escort for transfer. In contrast, patients with malignant middle cerebral artery syndrome or posterior circulation stroke, including those with basilar artery lesions, are at significant risk of deterioration and should be assessed by a clinician with critical care capabilities pre-transfer.

Patients who are candidates for, or who have received, intravenous thrombolysis, should have their blood pressure maintained below 185/110mmHg. Patients being transferred for thrombectomy alone should have hypertension treated if systolic blood pressure is greater than 220mmHg or diastolic >120mmHg. Hypotension should be avoided; there is little evidence for a precise target and 90mmHg is pragmatically advised in this guideline.

Intracranial abscesses, infections, hydrocephalus, and space occupying lesions

Patients may require time critical transfer for a range of other neurosurgical conditions. Given the heterogeneity of this population, it is difficult to offer generic advice. Close communication with the neurosurgical team is essential. They can advise on the urgency of transfer and appropriate treatment to be given prior to transfer, such as steroids, antibiotics and antiepileptic medication.

5.7 Incidents

All adverse incidents must be reported via the trust's adverse incident reporting system and to the Greater Manchester Critical Care Network.

NHS indemnity normally applies for NHS staff undertaking transfer within their scope of practice. The Intensive Care Society and Association of Anaesthetists provide personal injury insurance as a benefit of membership.

6. Roles & Responsibilities

6.1 Role 1

Guideline authors: update guideline periodically as required to reflect new evidence, guidance or change in practice.

6.2 Role 2 Guideline users: to report any concerns relating to the content and advice in this guideline to the guideline authors. Any adverse incidents should be reported via the DATIX system.

7. Monitoring Document Effectiveness

This guideline requires review at regular intervals to update the advice it details based on future evidence, guidance, or change to local practice/service structure. Unless early review is required, it will be reviewed and updated five years post publication. Adverse incidents related to transfer of critically ill adults with acute brain injury will be reviewed via existing governance structures.

8. Abbreviations & Definitions

AAGBI	Association of Anaesthetists of Great Britain and Ireland	kPa	Kilopascals
AVM	Arterio-venous malformation	kg	Kilograms
BNF	British National Formulary	MAP	Mean arterial pressure
BP	Blood pressure	MCA	Middle cerebral artery
C-spine	Cervical spine	mg	Milligram
CPP	Cerebral perfusion pressure	mls	Millilitres
CT	Computerised Tomography	mmHg	Millimetres of mercury
CVC	Central venous catheter (‘central line’)	mmol/l	Millimoles per litre
DBP	Diastolic blood pressure	NCA	Northern Care Alliance
DNACPR	Do not attempt cardiopulmonary resuscitation	NGXXX	NICE Guideline (reference number)
ECG	Electrocardiography	NHSE-NW	NHS England (North West)
ED	Emergency Department	NICE	National Institute for Health and Care Excellence
ESO	European stroke organisation	NWAS	North West Ambulance Service
ETA	Estimated time of arrival	O_2	Oxygen
$EtCO_2$	End tidal concentration of carbon dioxide	ODP	Operating department practitioner
g	Grams	OOH	Out of hours
GCS	Glasgow Coma Scale	PaCO2	Arterial partial pressure of carbon dioxide
GM CCN	Greater Manchester Critical Care Network	PaO2	Arterial partial pressure of oxygen
GPICS	Guidelines for the Provision of Intensive Care Services	PEEP	Positive End Expiratory Pressure
GTN	Glyceryl trinitrate	RMCH	Royal Manchester Children’s Hospital
Hb	Blood haemoglobin concentration	RSI	Rapid sequence induction/intubation
I&V	Intubated and ventilated	SAH	Subarachnoid haemorrhage
ICH	Intracerebral haemorrhage	SBP	Systolic blood pressure
ICM	Intensive Care Medicine	SCO	Salford Care Organisation
ICP	Intracranial Pressure	SpO2	Oxygen saturation (%)
ICS	Intensive Care Society	TBI	Traumatic Brain Injury
IFT	Interfacility transfer	TTL	Trauma team leader
IV	Intravenous		

9. References

1. Association of Anaesthetists. Safe transfer of the brain-injured patient: trauma and stroke, 2019. Anaesthesia 2020; 75; 234-246

2. Faculty of Intensive Care Medicine & Intensive Care Society. Guidance on: The Transfer of the Critically Ill Adult. Faculty of Intensive Care Medicine 2019 [online]. Accessed May 2023. Available from URL: https://www.ficm.ac.uk/sites/ficm/files/documents/2021-10/Transfer_of_Critically_Ill_Adult.pdf

3. North West Critical Care and Major Trauma Operational Delivery Networks. Standards & Guidance: Intra and Inter-Hospital Critical Care Transfers (Adult Patients). NW CCN 2020 [online]. Accessed May 2023. Available from URL: https://www.gmccmt.org.uk/wp-content/uploads/2021/05/2019-NW-Critical-Care-Networks-Transfer-Policy-final-Aug-19-revised-07-20.pdf

4. Faculty of Intensive Care Medicine and Intensive Care Society. Guidelines for the provision of Intensive Care Services v2.1. FICM/ICS 2022. Section 1.7

5. National Institute for Health and Care Excellence. Head Injury: assessment and early management. NG232 2023

6. Patel HC, Bouamra O, Woodford M et al. Trends in head injury outcome from 1989 to 2003 and the effect of neurosurgical care: an observational study. Lancet 2005; 366; 9496; 1538-1544.

7. National Institute for Health and Care Excellence. Stroke and transient ischaemic attack in over 16s: diagnosis and initial management. NG128 2019, update 2022.

8. European Stroke Organisation. European Stroke Organisation (ESO) guidelines on blood pressure management in acute ischaemic stroke and intracerebral haemorrhage. European Stroke Journal 2021; 6;2

9. Naisbitt J, Ferris P. Traumatic Brain Injury Management Guideline. Northern Care Alliance NHS Foundation Trust Internal Guideline 2021 [online]. Accessed May 2023. Available from URL: https://www.neuroicu.guru

10. Naisbitt J, Ferris P, Claxton A, Parkin E, Hodd J. Sub-arachnoid Haemorrhage – Guideline for management of patients admitted to Critical Care. Northern Care Alliance NHS Foundation Trust Internal Guideline 2019 [online]. Accessed May 2023. Available from URL: https://www.neuroicu.guru

11. Estcourt LJ, Birchall J, Allard S, Bassey SJ et al. Guidelines for the use of platelet transfusions. Br J Haematol 2017, 176: 365-394

12. Baharoglu M, Cordonnier C, Al-Shahi Salman R, Koen de Gans et al. Platelet transfusion versus standard care after acute stroke due to spontaneous cerebral haemorrhage associated with antiplatelet therapy (PATCH): a randomised, open-label, phase 3 trial. Lancet 2016; 387; 10038; 2605-2613

13. Kallingal J. Management of Blood Pressure in Acute Ischaemic Stroke Quick Reference Guide. Northern Care Alliance NHS Foundation Trust Internal Guideline 2022.

14. National Institute for Health and Care Excellence. Major Trauma: assessment and initial management. NG39 2016

15. CRASH-2 Trial collaborators. Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial. Lancet 2010; 376; 23-32

16. CRASH-3 Trial collaborators. Effects of tranexamic acid on death, vascular occlusive events, and other morbidities in patients with acute traumatic brain injury (CRASH-3): a randomised, placebo-controlled trial. Lancet 2019; 394; 1713-1723

17. Association of Ambulance Chief Executives. National framework for inter-facility transfers. March 2021 v 2.

18. Zampieri FG, Machado FR, Biondi RS et al. Effect of intravenous fluid treatment with a balanced solution vs 0.9% saline solution on mortality in critically ill patients: The BaSICS randomized clinical trial. JAMA 2021; 346(9); p818-829

19. National Institute for Health and Care Excellence. Spinal Injury: assessment and initial management. NG41 2016

20. Hall L, Naisbitt MJ, Wildman S, Brown S et al. Acute spinal cord injury guidelines. Northern Care Alliance NHS Foundation Trust Internal Guideline 2020 [online]. Accessed Sep 2023. Available from URL: https://www.neuroicu.guru

21. Cowley A, Nelson M, Hall C et al. Recommendation for changes to the guidelines of trauma patients with potential spinal injury within a regional UK ambulance trust. Br Paramad J 2022; 7; 3; 59-67

22. Parry-Jones A. Blood pressure monitoring and treatment in spontaneous, non-aneurysmal, intracerebral haemorrhage. Northern Care Alliance NHS Foundation Trust Internal Guideline 2023 [online]. Accessed March 2024. Available on the NCA Policy Hub here.

23. Parry-Jones A. Management of anticoagulant-associated spontaneous intracerebral haemorrhage. Northern Care Alliance NHS Foundation Trust Internal Guideline 2023 [online]. Accessed March 2024. Available on the NCA Policy Hub here.

Acknowledgement of sources

The authors acknowledge the pre-existing guidelines and evidence surrounding inter-hospital transfer at both a national and regional level, some of which has informed the advice provided within this guideline. The guidelines used, with a view for this document to compliment and provide regional specific advice, are acknowledged in section 2 and the references sections above.

10. Document Control Information

Part 1: Lead Author, Consultation Details, Communication Plan

Must be fully completed by the author prior to submission for approval.

Name of lead author	Dr Nick Coffin & Dr Fiona Wallace
Job title	Specialty Trainee in Intensive Care Medicine (ICM), Health Education North West & Consultant in ICM and Anaesthesia, Salford Care Organisation, Northern Care Alliance
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Consultation: List persons/group included in consultation. Include Pharmacy/Medicine Optimisation Group (MOG) for documents containing drugs. Indicate whether feedback used/ received and no suggested changes (FU), not used (FNU) or not received (NR).

Name/s of person or group	State which Care Organisations/ corporate services/staff groups the person or group represents	Date	Response: FU/FNU/NR
Ms Emma Boxall	NCA, SCO Critical Care Pharmacist	Oct 23	FU
Dr Mike Dias	NCA, SCO Consultant in Intensive Care Medicine & Acute Internal Medicine	20/10/23	FU
Mr Joshi George	NCA, SCO Clinical Director for Neurosurgery	04/07/23	FU
Dr Chris Grant	Executive Medical Director, NWAS NHS Trust	26/05/23	FU
Dr Oliver Harrison	NCA, SCO Consultant Anaesthetist, Governance Lead for Major Trauma	10/03/24	FU
Dr Khowla Hashaishi	NCA, SCO Consultant Haematologist	Oct 23	FU
Professor Dan Horner	NCA, SCO Consultant in Intensive Care Medicine and Emergency Medicine	07/11/2023	FU
Dr Scott Houston	NCA, SCO Consultant in Intensive Care Medicine	17/10/23	FU
Dr Steve Knight	Joint Medical Lead, GM CCN	13/03/24	FU
Dr Carel Kruger	NCA, SCO Consultant in Emergency Medicine	26/05/23	FU
Dr Fraser McNiven	NCA, SCO Consultant in Intensive Care Medicine and Emergency Medicine	17/10/23	FU
Ms Victoria Parr	Greater Manchester Critical Care and Major Trauma Network Director	11/03/24	FU
Dr Adrian Parry-Jones	NCA, SCO Consultant in Stroke Medicine	22/05/23	FU
Dr Alistair Rennie	NCA, SCO Consultant in Emergency Medicine and co-clinical lead of Greater Manchester Major Trauma Network	11/03/24	FU
Dr Dwai Sen	NCA, SCO Consultant in Stroke Medicine	21/05/23	FU
Dr Martin Thomas	NCA, SCO Consultant Haematologist	05/02/24	FU
Dr Sheila Tose	NCA, SCO Consultant Anaesthetist, Clinical lead for Major Trauma.	08/03/24	FU

Mr Naveed Yasin	NCA, SCO Consultant Spinal Surgeon, Chair: Division of Tertiary Medicine & Critical Care	24/08/23	FU
GM CCN Clinical Effectiveness Committee	Greater Manchester Critical Care Network	08/03/24	FU
GM CCN RiCON Transfer Group	Greater Manchester Critical Care Network	July & Oct 23	FU
Neuro Critical Care Group	NCA, SCO	25/05/23	FU
SCO Critical Care Governance Group	NCA, SCO	07/11/2023	FU

Equality Impact Assessment sign off: See Section 11.

Name (Lead from EDI team)	Joe McMahon
Date	26/01/2024

Communication plan: State in the box below how practice in this document will be rolled out across the organisation and embedded. A communication plan may be requested for review by the approving committee – if applicable, add owner details.

On approval, it is proposed this document be available through the NCA policy hub. It is proposed the guideline be disseminated via the Greater Manchester Critical Care Network to all of the region's trust transfer leads for further dissemination throughout

Part 2: Committee Approval

Must be fully completed by the author following committee approval. Failure to complete fully will potentially delay publication of the document. Submit to the Document Control Team at document.control@nca.nhs.uk for publication.

Approval date	21/03/2024
Method of approval (delete as appropriate)	Formal Committee decision / Chairperson's approval
Name of approving Committee	Medicines Optimisation Committee
Chairperson Name / Role	Lindsay Harper & Dr Richard Cooper, Chairs of Medicines Optimisation Committee
Amendments approval: Name of approver, version number and date. Do not amend above details	

Approval date	09/04/2024
Method of approval (delete as appropriate)	Formal Committee decision / Chairperson's approval
Name of approving Committee	Clinical Standards & Policies Meeting
Chairperson Name / Role	Dr Janet Hegarty, Chair of Clinical Standards & Policies Group
Amendments approval: Name of approver, version number and date. Do not amend above details	

Part 3: Search Terms and Review Arrangements

Must be fully completed by the author prior to publication.

Keywords & phrases	Transfer; Critical Care; Brain Injury; Traumatic Brain Injury; Subarachnoid haemorrhage; intracranial bleed; time critical transfer; intubation; neurosurgery; neurosurgeon; critically ill; hydrocephalus; intensive care
Document review arrangements	Review will occur by the author, or a nominated person, within three years or earlier should a change in legislation, best practice, or other change in circumstance dictate.
Special requests	On publication dissemination of guideline to all trusts within the region who refer to SCO for tertiary neurosciences care for their reference/use on transfer via the Greater Manchester Critical Care Network

11. Equality Impact Assessment (EqIA) tool

- The below tool must be completed at the start of any new or existing policy, procedure, or guideline development or review. For ease, all documents will be referred to as 'policy'. The EqIA should be used to inform the design of the new policy and reviewed right up until the policy is approved and not completed simply as an audit of the final policy itself.
- All sections of the tool will expand as required.
- EqIAs must be sent for review prior to the policy being sent to committee for approval. Any changes made at committee after an EqIA has been signed off must result in the EqIA being updated to reflect these changes. Policies will not be published without a completed and quality reviewed EqIA.

Help and guidance available:

- Equality Impact Assessment Help Resource
- Email the EDI Team: eqia@nca.nhs.uk for advice or training information.
- Submit documents requiring EqIA sign off to: eqia@nca.nhs.uk. Allow an initial four-week turnaround.
- Where there is a statutory or significant risk, requests to expedite the review process can be made by exception to the Group Equality & Inclusion Programme Manager: Yasmin.bukhari@nca.nhs.uk

Part 1: Possible Negative Impacts

Protected Characteristic	Possible Impact	Action/Mitigation
Age	Patients aged between 16-18 have split pathway depending on whether they are known to RMCH – patients known to RMCH will be referred and managed at RMCH, otherwise will be accepted at SCO – risk of delay in transfer to definitive destination. Children are not catered for in this guideline	Established pathway that is known to neurosurgical directorate and now present within this guideline to clarify correct pathway to assist referring hospital in contacting correct centre – an example of need to disseminate this guideline to referring trusts on publication. Other paediatric guidelines exist.
Disability	Communication	Involvement of NOK/family/carers/appointed guardians
Ethnicity	Communication in case of language barriers	Local trust guidance on use of interpreting services
Gender	None anticipated	
Marriage/Civil Partnership	None anticipated	
Pregnancy/Maternity	There are no obstetric services available on site at Salford Royal. In exceptional cases for immediate lifesaving surgery pregnant patients may be admitted to SCO	Patients with a gestational age > 20+0/40 referred to, and cared at Royal Preston Hospital. Exceptional circumstances may require SCO management of a pregnant patient if time doesn't permit transfer in order to save life.
Religion & Belief	This guideline discusses the use of blood products in the initial resuscitation of patients with impaired clotting ability, the receipt of which may not be acceptable to certain persons.	This guideline discusses this in reference to local and national guidance and recommends adherence to these guidelines and national legislation alongside discussion with local haematology colleagues.
Sexual Orientation	None anticipated	
Trans	None anticipated	
Other Under Served Communities (Including Carers, Low Income, Veterans)	None anticipated	

Part 2: Possible Opportunity for Positive Impacts

Protected Characteristic	Possible Impact	Action/Mitigation
Age	Different referral centres for emergency neurosciences intervention based on age (<16, 16-18, >18 years)	This guideline clearly outlines the established pathway and which centre in the region is the correct one for referrals based on age
Disability	n/a	
Ethnicity	n/a	
Gender	n/a	
Marriage/Civil Partnership	n/a	
Pregnancy/Maternity	No on-site obstetric provision at Salford Royal	This guideline outlines the differing pathways for pregnant patients to allow timely decision making at referring centre
Religion & Belief	n/a	
Sexual Orientation	n/a	
Trans	n/a	
Other Under Served Communities (Including Carers, Low Income, Veterans)	n/a	

Part 3: Combined Action Plan

Action *(List all actions & mitigation below)*	**Due Date**	**Lead** *(Name & Job Role)*	**From Negative or Positive Impact?**
Disseminate Guideline to relevant hospitals and trusts covered by the service	**On publication/approval**	**Lead authors**	**Both**

Part 4: Information Consulted and Evidence Base *(Including any consultation)*

Protected Characteristic	Name of Source	Summary of Areas Covered	Web link/contact info
Age	See below		
Disability	See below		
Ethnicity	See below		
Gender	See below		
Marriage/Civil Partnership	See below		
Pregnancy/Maternity	See below		
Religion & Belief	See below		
Sexual Orientation	See below		
Trans	See below		
Other Under Served Communities (Including Carers, Low Income, Veterans)	See below		

Part 4, Name of Source: Associated Documents Listed in section 2 of policy.

Part 5: EqIA Update Log (Detail any changes made to EqIA as policy has developed and any additional impacts included)

Date of Update	Author of Update	Change Made
18/10/2023	Dr Nick Coffin	Sections 1-5

6. Have all of the negative impacts you have considered been fully mitigated or resolved? *(If the answer is no, please explain how these don't constitute a breach of the Equality Act 2010 or the Human Rights Act 1998)*
Impact has been mitigated as described above in section 1 & 2.

7. Please explain how you have considered the duties under the accessible information standard if your document relates to patients?
As stated above in section 1, including Involvement of NOK/family/carers/appointed guardians.

8. Equality Impact Assessment completed and signed off? *(Insert named lead from EDI Team below). Please also add this information to Section 10 Part 1.*
Name: Joe McMahon **Date: 26/01/2024**

12. Appendices

Contents of appendices:

- Appendix 1 – Greater Manchester Critical Care Network Transfer form
- Appendix 2 – Greater Manchester Critical Care Network Transfer checklist
- Appendix 3 - Greater Manchester Critical Care Network Handover Form
- Appendix 4 – Greater Manchester Major Trauma Network Severe TBI TTL Transfer Neurosurgical Criteria guideline with hyperlink to full guidance
- Appendix 5 – Greater Manchester Major Trauma Network Major Trauma transfer checklist (online version available here)

These appendices have been included for information purposes with the permission of the GM CCN RiCON Transfer Committee (October 2023) & the Greater Manchester Major Trauma Network.

Critical Care Network forms are available from here.
Major Trauma Network pathways and policies are available from here.

Appendix 1 Greater Manchester Critical Care Network Transfer form

NHS
Greater Manchester Critical Care & Major Trauma Network

Complete with a ballpoint pen

Fix addressograph to each copy if available

Name:
Number:
D.O.B:
Address :

Date of Hospital Admission	
Date of Transfer	
Pre-departure check list	Pre Y ☐ N ☐
Has a RA been undertaken?	Y ☐ N ☐
Transfer risk	Low ☐ Medium ☐ High ☐

Transfer Details

Transferring unit	Hospital Name:
	ICU ☐ HDU ☐ ED ☐ Theatre ☐ Ward ☐ Other, please specify:
Receiving unit	Hospital Name:
	ICU ☐ HDU ☐ ED ☐ Theatre ☐ Ward ☐ Other, please specify:
Reason for transfer	Expert management: Neuro ☐ Cardiac ☐ Renal ☐ ECMO ☐ Other, please specify:
	No critical care bed ☐ Repatriation ☐ Other, please specify:

Staff Arranging Transfer

At transferring unit	Name / speciality	Consultant in charge
At receiving unit	Name / speciality	Consultant in charge

Escorting Personnel

Doctor	Name	Grade	GMC No
Nurse	Name	Department	
ODP	Name		

Spinal Precautions

Timings (hh:mm)

Referral accepted	
Ambulance Requested	
Ambulance arrived	
Departure from Base	
Arrived destination	

Ambulance Details

Agreed category	Cat 1 Life-threatening emergency (7 mins) ☐
Incident booking number	Cat 2 Emergency transfer (18 mins) ☐
	Cat 3 Urgent transfer (< 2hours) ☐
	Cat 4 Non-urgent (< 3 hours) ☐

History & Diagnosis

Trauma patient?	Yes ☐ No ☐
Pre-sedation GCS	/15 (E= V= M=)
Known Allergy or HCAI	

Vascular Access include Size and Site

PVC
PVC
PVC
CVC line
Arterial line

Other Devices

Chest drains ☐	Number / site
Abdominal drains ☐	Number / site
Catheter ☐	
E.T tube ☐ Size:	Length at lips:
Subglottic tube: Yes ☐ No ☐	Laryngoscopy grade:
Other, please specify:	

Monitoring

SpO_2 ☐ ECG ☐ NIBP ☐ IABP ☐ Temp ☐ $ETCO_2$ ☐ CVP ☐ Other, please specify:

Ventilation During Transfer

Spontaneous ☐	Mechanical ☐	Ventilator type:	Mode of ventilation:	PEEP:

Has adverse / critical incident occurred during the transfer? Please give details

If yes please also submit incident report

Transfer team comments	Receiving team comments
	Handover Checklist Y ☐ N ☐
Signature of escorting personnel:	Name and signature of receiving staff:

FOLD

TRANSFER CHART

NAME:
NUMBER:

	TIME	
GCS	EYES (1-4)	
	VERBAL (1-5)	
	MOTOR (1-6)	
	GCS TOTAL (3-15)	
PUPILS	RIGHT SIZE	
	RIGHT REACTION	
	LEFT SIZE	
	LEFT REACTION	
DRUGS		
FLUIDS	CRYSTALLOID	
	COLLOID	
	BLOOD PRODUCTS	
VENTILATION PARAMETERS	FiO_2	
	$ETCO_2$	
	PEAK AIRWAY PRESSURE	
	TIDAL VOLUME (ml/s)	
	SpO_2	
	RESPIRATORY RATE	
BP AND PULSE RATE	190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20	
MONITORING	BLOOD GLUCOSE	
	CENTRAL VENOUS PRESSURE	
	URINE OUTPUT	
	CHEST DRAINAGE	
	TEMPERATURE	

The top (white copy) of the form should be filed with the patients notes (receiving hospital) and the second copy sent to Greater Manchester Critical Care Network, NHS, Regus, Manchester Business Park, 3000 Aviator Way, Wythenshawe, Manchester, M22 5TG.
NB: Transferring unit - please email the network when a transfer occurs and where possible email transfer forms to us on **CCN.Transfer@mft.nhs.uk**

Version 3 August 2019

CM17380 REV

Appendix 2 Greater Manchester Critical Care Network Transfer checklist

Greater Manchester Critical Care Network

NHS

Checklist for Critical Care Transfers **OUT**

In Transferring Hospital:

1. Preparation	
Patient fit for transfer	
Transfer trained medical and qualified nursing or ODP staff available	
Infection prevention and control issues identified and communicated to receiving team	
Bed confirmed at destination	
Named accepting speciality consultant and critical care consultant identified	
Case notes and investigations photocopied or printed	
Patient and/or relatives informed	
Patient valuables secured	
Ambulance service contacted, appropriate personnel & vehicle for transfer trolley confirmed	
Destination hospital and department location confirmed	

2. Patient Checks			
Airway		**Disability**	
Safe and secure		Seizures controlled	
ETT/tracheostomy position confirmed		ICP managed	
NGT in position		Sedation +/- Paralysis	
Breathing		**Exposure / Metabolic**	
Ventilation established		Temperature maintained	
Arterial blood gas checked		Urinary catheter checked	
Capnography in use		Glucose > 4mmol/l	
Bilateral breath sounds		Potassium < 6, Ionised calcium > 1mmol/l	
HMEF		**Monitoring**	
Circulation		ECG, BP, Sa02, ETC02	
CVC stable		Indwelling lines, tubes secure/accessible	
Hb adequate		**Trauma**	
Minimum two routes of IV access		C-Spine stable/ protected	
A-Line + CVC working and zeroed		Pneumothoraces drained	
Blood for transfer checked		Thoracic/Abdominal bleeding controlled	
		Long bone/pelvic fractures stabilised	

3. Immediate Pre-departure Time Out *Read aloud with all transfer team members present, including paramedics*	
Introductions of staff completed	
Patient stable on transfer trolley and monitoring in place	
Emergency airway equipment available	
Oxygen & batteries adequate (use ambulance oxygen & electrics)	
Intra-venous access established and checked	
Infusions running and secure	
Spare sedatives/vasopressors/inotropes/fluids available as required	
Blankets/heat loss measures in place	
Pressure points protected	
Transferring & receiving unit phone numbers available (mobile phone)	
Specific potential problems and how we manage them	
Receiving unit informed of departure	
Directions to destination department and hospital known	

Greater Manchester Critical Care Network

NHS

Checklist at Receiving Hospital **IN**

Transfer of care/handover for patient coming from another hospital:

1. Before moving patient and introductions	
All staff to introduce themselves (accepting and transferring teams, name and role)	
Introductions complete?	
Who will control airway and supervise transfer?	
Any immediate concerns? What infusions are running? What are ventilator settings?	
Will ventilator tubing and lines reach?	

Move the patient under direction of the airway supervisor. Then:

2. Handover Procedures	
Patient established on ventilator with capnography in place?	
Infusions transferred to receiving unit's pumps?	
Monitoring transferred?	

3. Handovers (All staff listen to both handovers)	
Medical Handover	
History current problem and mechanism of injury	
Airway or ventilation problems	
Interventions during resuscitation and transfer and any problems	
Current medications	
Tubes and lines	
Wounds and drains	
Past medical history as known	
Allergies and previous medications as known	
Other problems/issues for handover	
Nursing Handover	
Pressure areas/tissue viability	
Property	
Religious/spiritual needs	
Relative information handed over	
Documentation and case notes handed over	
Check after handover procedures complete	
Patient belongings off-loaded	
Transfer equipment re-loaded	
Is bed head airway sign completed and allergies recorded?	

4. Information about transfer: transferring and receiving doctors:	
Both check the transfer form for completeness - dates and times and other boxes before signing.	
Please send yellow copy of the transfer form to GMCCN, Regus, 3000 Aviator Way, Wythenshawe, Manchester, M22 5TG	

Comments to CCN.Transfer@mft.nhs.uk

To link through to the latest printable version of this handover form on the GM CCN website click here.

Appendix 3 Greater Manchester Critical Care Network Handover Form

Greater Manchester Critical Care & Major Trauma

This form is for completion by the medical team wishing to refer their patient between intensive care units.

CRITICAL CARE HANDOVER FORM FOR A INTERHOSPITAL TRANSFERRED PATIENT

PATIENT DETAILS
Name:
DOB:
Hospital number:
NHS number:
Gender:

ICU TRANSFERRED FROM:
DATE OF TRANSFER:
CONTACT DETAILS OF TRANSFERRING UNIT
URGENT ENQUIRIES (eg. On-call Registrar):
ICU CONTACT NUMBER:

PAST MEDICAL HISTORY

BASELINE MOBILITY & RELEVANT SOCIAL HISTORY

PRESENTING COMPLAINT
Diagnosis:
History:

SIGNIFICANT EVENTS DURING CRITICAL CARE STAY

DRUG HISTORY
Allergies (with details of reactions):

Pre-admission (including transplant/methadone):

Critical therapies given including stat/loading doses and IVIG:

Current critical care medications (including sedation & anticoagulation)

MEDICATION	Start date

2

SYSTEM REVIEW

A- (Intubated/Tracheostomy/Date/Grade of intubation/Length of tube at teeth)

B- (Sp02 target/Ventilator settings/Details of bronchoscopy/Chest drains/Proned/Physiotherapy)

C- (MAP target/Fluid balance/Recent ECG and echo/Renal replacement)

D- (AVPU/GCS/RASS/Focal neurology/Analgesia/Emotional/psychological needs)

E- (Pyrexia/Bowels/skin integrity)

BLOOD TESTS

TYPE	DATE	RESULTS
FBC		
U+ES		
LFTS		
INFLAMMATORY		
COAGULATION		
ABG		
OTHER, including drug levels		

IMAGING

TYPE	DATE	RESULT SUMMARY

ACCESS/ LINES/ URINARY CATHETER

TYPE	LOCATION	ANTT Y/ N	DATE INSERTED

3

MICROBIOLOGY – Include routine and COVID swabs			
TYPE	DATE		RESULTS/ SENSITIVITES

ANTMICROBIALS			
ANTIMICROBIAL	INDICATION	MICRO INVOLVED Y/N	START DATE / DURATION

NUTRITIONAL PLAN
(Please include if any feed breaks occur in consideration to enteral medication)

INSULIN REQUIREMENTS

INTERVENTIONS NEEDING ACTION OR FOLLOW UP
(Please include contact details of relevant team if applicable)

Other key monitoring including drug levels/HbA1c/Follow up monitoring:

4

COMMUNICATION
Include details of Knowledge of diagnosis/Family updates/Relative and NOK information/Language barriers

ANY OTHER RELEVANT INFORMATION

REFERRER INFORMATION

Name:

Job title:

Consultant responsible:

Signature:

4

To link through to a printable version of this handover form on the GM CCN website click here.

Appendix 4 Greater Manchester Major Trauma Network Severe TBI: TTL Transfer Neurosurgical Criteria (hyperlink to full guidance)

The Greater Manchester Major Trauma Network's Severe Traumatic Brain Injury TTL Transfer Neurosurgical Criteria guideline is included here for reference. To link through to this guideline please click here.

Further Greater Manchester Major Trauma transfer policies and guidelines are available online here.

Appendix 5 Greater Manchester Major Trauma Network Major Trauma transfer checklist

Greater Manchester Major Trauma Network

NHS

This form is to be completed for all Major Trauma TTL to TTL transfers. It is the responsibility of the Trauma Team Leader to ensure this is completed for the safe transfer of the patient. Any deviation from this checklist should be clearly documented. This form does not replace the Network inter-hospital transfer form which should be completed for every transfer. A copy of this checklist should remain with the transferring unit and the original form should go with the patient

PATIENTS WHO NEED CRITICAL INTERVENTION SHOULD LEAVE ED WITHIN 30 MINUTES OF THE DECISION TO TRANSFER (NICE 2016)

MAJOR TRAUMA Transfer Checklist

Date/ Time of injury:			
Patient Name:			
Name of accepting Clinician (TTL @ receiving site):			
Date/ Time of TTL acceptance:			
EXTERNAL HAEMORRHAGE CONTROL	**Yes**	**No**	**N/A**
Tourniquet in situ (time applied if applicable: .....)			
External pressure dressings			
AIRWAY	**Yes**	**No**	**N/A**
Is the airway safe and secure			
Comment:			
ETT position OK			
C-spine protected or cleared			
BREATHING	**Yes**	**No**	**N/A**
Established on transport ventilator			
Capnography in use			
Pneumothoraces managed			
Chest drains secure			
Arterial blood gases (+ iCa if available)			
CIRCULATION	**Yes**	**No**	**N/A**
Thoracic /abdominal bleeding optimised			
2 routes patent IV access (accessible fluids running or ready to run)			
Blood & FFP available and checked if required			
Long bone splinted & pelvic binder in situ if required			
TXA (time .....)			
DISABILITY	**Yes**	**No**	**N/A**
Sedation+/- paralysis			
Seizures controlled			
ICP management			
EXPOSURE/METABOLIC	**Yes**	**No**	**N/A**
Temperature maintained			
Spinal protection (if required)			
Glucose > 4 mmols/L			
Potassium < 6mmols			
IMMEDIATE PRE-DEPARTURE CHECK	**Yes**	**No**	**N/A**
Transfer Team introductions			
Patient monitor connected (and fully charged)			
Emergency airway equipment available			
Oxygen & battery replacements			
IV access patent/ lines secure			
Spare sedatives/vasopressors/inotropes/fluids available			
Temperature control measures in place			
Receiving ED informed of departure			
Name/ Signature of referring TTL:			

GM Major Trauma Network TTL Transfer Checklist (v.7)

Receiving hospital to undertake 'Hands off' handover			
At receiving hospital MAJOR TRAUMA handover			
Handover Preparation			
	Yes	**No**	**N/A**
Introductions complete			
Team Leader supervising airway/ supervising transfer identified			
Fluids/Lines identified			
Procedures			
	Yes	**No**	**N/A**
Patient established on ventilator			
Is the airway safe and secure			
Infusions transferred			
Monitoring transferred			
Handover (all staff to listen to handover)	**Yes**	**No**	**N/A**
MEDICAL HANDOVER			
History (SBAR summary)			
Airway or ventilation problems			
Interventions			
Current medications			
Tubes and lines			
Wounds and drains			
Imaging (on disc or loaded on PACS)			
Past Medical history if known			
Any other issues:			
NURSING HANDOVER	**Yes**	**No**	**N/A**
Pressure areas and tissue viability			
Property			
Relative information			
Documentation / Case note handover			
Any other issues			
D. Transfer information			
	Yes	**No**	**N/A**
Both transfering and receiving Drs to sign transfer form			
Ensure handover checklist completed and boxes ticked on form			
Copy of the Inter-hospital transfer form sent to the Network			
Name/ Signature of receiving TTL:			

To link through to a printable version of this handover form on the GM CCN website click here.