Major trauma: assessment and initial management

NICE guideline: short version

Draft for consultation, August 2015

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This guideline covers the care of people with major trauma in pre-hospital and hospital settings. It includes recommendations on managing:

- the airway
- chest trauma
- haemorrhage
- shock
- temperature
- pain.

The guideline does not cover people with burns, spinal injuries (see the draft NICE guideline on spinal injury) or complex fractures (see the draft NICE guideline on fractures [complex]).

Who is it for?

- People with major trauma, their families and carers.
- Healthcare professionals and practitioners who provide care for people with major trauma in pre-hospital and hospital settings.

This version of the guideline contains the recommendations, context and recommendations for research. The Guideline Committee's discussion and the evidence reviews are in the full guideline.

Other information about how the guideline was developed is on the project page. This includes the scope, and details of the Guideline Committee and any declarations of interest.

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Contents

Recommendations

People have the right to be involved in discussions and make informed decisions about their care, as described in Your care.

Using NICE guidelines to make decisions explains how we use words to show the strength of our recommendations, and has information about safeguarding, consent and prescribing medicines.

Recommendations apply to both children (under 16s) and adults (over 16s) unless otherwise specified.

1.1 Airway management

The NICE draft guideline on trauma: service delivery contains a recommendation for ambulance and hospital trust boards, medical directors and senior managers on drug-assisted rapid sequence induction of anaesthesia and intubation.

1.1.1 Use drug-assisted rapid sequence induction (RSI) of anaesthesia and intubation as the definitive method of securing the airway in patients with major trauma who cannot maintain their airway and/or ventilation.

1.1.2 If RSI fails, use basic airway manoeuvres and adjuncts and/or a supraglottic device until a surgical airway or assisted endotracheal placement is performed.

Airway management in pre-hospital settings

1.1.3 Aim to perform RSI at the scene of the incident and within 30 minutes of the initial call to the emergency services.

1.1.4 If RSI cannot be performed at the scene:

- consider using a supraglottic device if the patient's airway reflexes are absent

- use basic airway manoeuvres and adjuncts if the patient's airway reflexes are present or supraglottic device placement is not possible
- transport the patient to a major trauma centre for RSI provided the journey time is less than 60 minutes

- otherwise divert to a trauma unit for RSI before onward transfer.

1.2 Management of chest trauma in pre-hospital settings

1.2.1 Use clinical assessment to diagnose pneumothorax for the purpose of triage or intervention.

1.2.2 Consider using eFAST (extended focused assessment with sonography for trauma) to augment clinical assessment only if a specialist team equipped with ultrasound is immediately available and onward transfer will not be delayed.

1.2.3 Be aware that a negative eFAST of the chest does not exclude a pneumothorax.

1.2.4 Only perform chest decompression in a patient with suspected tension pneumothorax if there is haemodynamic instability or severe respiratory compromise.

1.2.5 Use open thoracostomy instead of needle decompression if the expertise is available.

1.2.6 Observe patients after chest decompression for signs of recurrence of the tension pneumothorax.

1.2.7 In patients with an open pneumothorax:

- cover the open pneumothorax with a simple occlusive dressing **and**
- observe for the development of a tension pneumothorax.

1.3 Management of chest trauma in hospital settings

Chest decompression of tension pneumothorax

1.3.1 In patients with tension pneumothorax, perform chest decompression before imaging only if they have either haemodynamic instability or severe respiratory compromise.

1.3.2 Perform chest decompression using open thoracostomy followed by a chest drain in patients with tension pneumothorax.

Imaging to assess chest trauma

1.3.3 Consider immediate chest X-ray and/or eFAST (extended focused assessment with sonography for trauma) as part of the primary survey to assess chest trauma in adults with severe respiratory compromise.

1.3.4 Consider immediate CT of the chest for adults without severe respiratory compromise who are responding to resuscitation or whose haemodynamic status is normal.

1.3.5 Consider chest X-ray and/or ultrasound for first-line imaging to assess chest trauma in children.

1.3.6 Do not routinely use CT for first-line imaging to assess chest trauma in children.

1.4 Management of haemorrhage in pre-hospital and hospital settings

Dressings and tourniquets in pre-hospital and hospital settings

1.4.1 Use simple dressings with direct pressure to control external haemorrhage.

1.4.2 In patients with major limb trauma use a tourniquet if direct pressure has failed to control life-threatening haemorrhage.

Pelvic binders in pre-hospital settings

1.4.3 Do not apply a pelvic binder unless active bleeding from a pelvic fracture is suspected.

1.4.4 Apply a purpose-made pelvic binder in people with haemodynamic instability and suspected pelvic fractures following blunt high-energy trauma.

1.4.5 Consider an improvised pelvic binder in children with haemodynamic instability and suspected pelvic fractures following blunt high-energy trauma if they are too small to fit a purpose-made pelvic binder.

Haemostatic agents in pre-hospital and hospital settings

1.4.6 Use intravenous tranexamic acid[1] as soon as possible in patients with active or suspected active bleeding.

1.4.7 Do not use intravenous tranexamic acid[1] more than 3 hours after injury unless there is evidence of hyperfibrinolysis.

Anticoagulant reversal in hospital settings

1.4.8 Rapidly reverse anticoagulation in patients who have major trauma with haemorrhage.

1.4.9 Hospital trusts that admit patients with major trauma should have a protocol for the rapid reversal of anticoagulation agents.

1.4.10 Use prothrombin complex concentrate immediately in adults with major trauma who have active bleeding and need emergency reversal of a vitamin K antagonist.

1.4.11 Do not use plasma to reverse a vitamin K antagonist.

[1] At the time of consultation (August 2015), tranexamic acid did not have a UK marketing authorisation for use in children and young people for this indication. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's Prescribing guidance: prescribing unlicensed medicines for further information.

1.4.12 Consult a haematologist immediately for advice on adults who have active bleeding and need reversal of any anticoagulant agent other than a vitamin K antagonist.

1.4.13 Consult a haematologist immediately for advice on children with major trauma who have active bleeding and may need reversal of any anticoagulant agent.

1.4.14 Do not offer anticoagulant reversal to patients who do not have active or suspected bleeding.

Activating major haemorrhage protocols in hospital settings

1.4.15 Use physiological criteria that include the patient's haemodynamic status and their response to immediate volume resuscitation to activate the major haemorrhage protocol.

1.4.16 Do not rely on a haemorrhagic risk tool applied at a single time point to determine the need for major haemorrhage protocol activation.

Circulatory access in pre-hospital settings

1.4.17 For circulatory access in patients with major trauma in pre-hospital settings:

- use peripheral intravenous access **or**
- if peripheral intravenous access fails, consider intra-osseous access.

1.4.18 For circulatory access in children with major trauma, consider intra-osseous access as first-line access if peripheral access is anticipated to be difficult.

Circulatory access in hospital settings

1.4.19 For circulatory access in patients with major trauma in hospital settings:

- use peripheral intravenous access **or**

- if peripheral intravenous access fails, consider intra-osseous access while central access is being achieved.

Volume resuscitation in pre-hospital and hospital settings

1.4.20 For patients with active bleeding use a restrictive approach to volume resuscitation until definitive early control of bleeding has been achieved.

1.4.21 In pre-hospital settings, titrate volume resuscitation to maintain a palpable central pulse (carotid or femoral).

1.4.22 In hospital settings, move rapidly to haemorrhage control, titrating volume resuscitation to maintain central circulation until control is achieved.

1.4.23 For patients who have haemorrhagic shock and a traumatic brain injury:

- if haemorrhagic shock is the dominant condition, continue restrictive volume resuscitation **or**
- if traumatic brain injury is the dominant condition, use a less restrictive volume resuscitation approach to maintain cerebral perfusion.

Fluid replacement in pre-hospital and hospital settings

1.4.24 In pre-hospital settings only use crystalloids to replace fluid volume in patients with active bleeding if blood products are not available.

1.4.25 In hospital settings do not use crystalloids for patients with active bleeding (see the NICE guideline on intravenous fluid therapy in adults in hospital for advice on tetrastarches in adults).

1.4.26 For adults use a ratio of 1 unit of plasma to 1 unit of red blood cells to replace fluid volume.

1.4.27 For children use a ratio of 1 part plasma to1 part red blood cells, and base the volume on the child's weight.

Haemorrhage protocols

1.4.28 Hospital trusts should have specific major haemorrhage protocols for adults and children.

1.4.29 For patients with active bleeding, start with a fixed-ratio protocol for blood products and change to a protocol guided by laboratory coagulation results at the earliest opportunity.

Haemorrhage imaging

1.4.30 Limit diagnostic imaging (such as chest and pelvis X-rays or FAST [focused assessment with sonography for trauma]) to the minimum needed to direct intervention in patients with suspected haemorrhage and haemodynamic instability who are not responding to volume resuscitation.

1.4.31 Be aware that a negative FAST does not exclude intraperitoneal or retroperitoneal haemorrhage.

1.4.32 Consider immediate CT for patients with suspected haemorrhage if they are responding to resuscitation or if their haemodynamic status is normal.

1.4.33 Do not use FAST or other diagnostic imaging before immediate CT.

1.4.34 Do not use FAST as a screening modality to determine the need for CT.

Whole-body CT

1.4.35 Use whole-body CT (consisting of a vertex-to-toes scanogram followed by a CT from vertex to mid-thigh) in adults with blunt major trauma and suspected multiple injuries.

1.4.36 Use clinical findings and the scanogram to direct CT of the limbs in adults with limb trauma.

1.4.37 Do not routinely use whole-body CT to image children. Use clinical judgement to limit CT to the body areas where assessment is needed.

Damage control surgery

1.4.38 Use damage control surgery in patients with haemodynamic instability who are not responding to volume resuscitation.

1.4.39 Consider definitive surgery in patients with haemodynamic instability who are responding to volume resuscitation.

1.4.40 Use definitive surgery in patients whose haemodynamic status is normal.

Interventional radiology

The NICE draft guideline on trauma: service delivery contains a recommendation for ambulance and hospital trust boards, medical directors and senior managers on interventional radiology and definitive open surgery.

1.4.41 Use interventional radiology techniques in patients with active arterial pelvic haemorrhage unless immediate open surgery is needed to control bleeding from other injuries.

1.4.42 Consider interventional radiology techniques in patients with solid-organ (spleen, liver or kidney) arterial haemorrhage.

1.4.43 Consider a joint interventional radiology and surgery strategy for arterial haemorrhage that extends to surgically inaccessible regions.

1.4.44 Use an endovascular stent graft in patients with blunt thoracic aortic injury.

1.5 Reducing heat loss in pre-hospital and hospital settings

1.5.1 Minimise ongoing heat loss in patients with major trauma.

1.6 Pain management in pre-hospital and hospital settings

Pain assessment

1.6.1 See the NICE guideline on patient experience in adult NHS services for advice on assessing pain in adults.

1.6.2 Assess pain regularly in patients with major trauma using a pain assessment scale suitable for the patient's age, developmental stage and cognitive function.

1.6.3 Continue to assess pain in hospital using the same pain assessment scale that was used in the pre-hospital setting.

Pain relief

1.6.4 For patients with major trauma, use intravenous morphine as the first-line analgesic and adjust the dose as needed to achieve adequate pain relief.

1.6.5 If intravenous access has not been established, consider the intranasal[2] route for analgesic delivery.

1.6.6 Consider ketamine in analgesic doses as a second-line agent.

1.6.7 Use intravenous morphine with caution in people with hypovolaemic shock and older people.

1.7 Documentation in pre-hospital and hospital settings

The NICE draft guideline on trauma: service delivery contains recommendations for ambulance and hospital trust boards, senior managers and commissioners on documentation within trauma networks.

[2] At the time of consultation (August 2015), intranasal morphine and ketamine did not have a UK marketing authorisation for use in children and young people for this indication. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's Prescribing guidance: prescribing unlicensed medicines for further information.

Recording information in pre-hospital settings

1.7.1 Record the following in patients with major trauma in pre-hospital settings:

- <C>ABCDE (catastrophic haemorrhage, airway with spinal protection, breathing, circulation, disability [neurological], exposure and environment)
- spinal pain
- motor function, for example hand or foot weakness
- sensory function, for example altered or absent sensation in the hands or feet
- priapism in an unconscious or exposed male.

1.7.2 If possible, record information on the trend of clinical assessments to show improvement or deterioration.

1.7.3 Record pre-alert information using a structured system and include all of the following:

- age and sex of the injured person
- time of incident
- mechanism of injury
- injuries suspected
- signs, including vital signs and Glasgow Coma Scale
- treatment so far
- estimated time of arrival at emergency department
- requirements (such as bloods, specialist services, on-call staff, trauma team or tiered response by trained staff)
- the ambulance call sign, name of the person taking the call and time of call.

Receiving information in hospital settings

1.7.4 A senior nurse or trauma team leader should receive the pre-alert information and determine the level of trauma team response.

1.7.5 The trauma team leader should be easily identifiable to receive the handover and the trauma team ready to receive the information.

1.7.6 The pre-hospital documentation, including the recorded pre-alert information, should be quickly available to the trauma team and placed in the patient's hospital notes.

1.7.7 Assess and record the items listed in recommendation 1.7.1, as a minimum, for the primary survey.

1.7.8 One member of the trauma team should have designated responsibility for completing all patient documentation.

1.7.9 The trauma team leader should be responsible for checking the information recorded to ensure it is complete.

Sharing information in hospital settings

1.7.10 Follow a structured process when handing over care within the emergency department (including shift changes) and to other departments. Ensure that the handover is documented.

1.7.11 Ensure that all patient documentation, including images and reports, goes with the patient when they are transferred to other departments or centres.

1.7.12 Provide a written summary within 24 hours of admission, which gives the diagnosis, management plan and expected outcome and is:

- aimed at the patient's GP
- written in plain English
- understandable by patients, family members and carers
- updated whenever the patient's clinical circumstances change
- readily available in the patient's records
- sent to the patient's GP on discharge.

1.8 Information and support for patients, family members and carers

The NICE draft guideline on trauma: service delivery contains recommendations for ambulance and hospital trust boards, senior managers and commissioners on support and information for patients, family members and carers.

Providing support

1.8.1 When communicating with patients, family members and carers:

- manage expectations and avoid misinformation
- answer questions and provide information honestly, within the limits of your knowledge
- do not speculate and avoid being overly optimistic or pessimistic when discussing information on further investigations, diagnosis or prognosis
- ask if there are any other questions.

1.8.2 The trauma team structure should include a clear point of contact for providing information to the patient, their family members or carers.

1.8.3 If possible, ask the patient if they want someone (a family member, carer or friend) with them.

1.8.4 If the patient agrees, invite their family member, carer or friend into the resuscitation room, accompanied by a member of staff.

Support for children and vulnerable adults

1.8.5 Allocate a dedicated member of staff to contact the next of kin and provide support for unaccompanied children and vulnerable adults.

1.8.6 Contact a mental health team as soon as possible for people who have a pre-existing psychological or psychiatric condition that might have contributed to their injury, or a mental health problem that might affect their wellbeing or care in hospital.

1.8.7 For a child or vulnerable adult with major trauma, enable their parents or carers to remain within eyesight if appropriate.

1.8.8 Work with family members or carers of children and vulnerable adults to provide information and support. Take into account the age, developmental stage and cognitive function of the child or vulnerable adult.

1.8.9 Include siblings of a child with major trauma when offering support to family members or carers.

Providing information

1.8.10 Explain to patients, family members and carers what is happening and why it is happening. Provide:

- information on known injuries
- details of immediate investigations and treatment, and if possible include time schedules
- information about expected outcomes of treatment, including time to returning to usual activities and the likelihood of permanent effects on quality of life, such as pain, loss of function or psychological effects.

1.8.11 Provide information at each stage of management (including the results of imaging) in face-to-face consultations.

1.8.12 Document all key communications with patients, family members and carers about the management plan.

Providing information about transfer from an emergency department to a ward

1.8.13 For patients who are being transferred from an emergency department to a ward, provide written information that includes:

- the name of the senior healthcare professional who spoke to them in the emergency department

- how the hospital and the trauma system works (major trauma centres, trauma units and trauma teams).

Providing information about transfer from an emergency department to another centre

1.8.14 For patients who are being transferred from an emergency department to another centre, provide verbal and written information that includes:

- the reason for the transfer, focusing on how specialist management is likely to improve the outcome
- the location of the receiving centre and the patient's destination within the receiving centre
- the name and contact details of the person responsible for the patient's care at the receiving centre
- the name of the senior healthcare professional who spoke to them in the emergency department.

1.9 Training and skills

Recommendations for ambulance and hospital trust boards, and senior managers

1.9.1 Provide each healthcare professional and practitioner within the trauma service with the training and skills to deliver, safely and effectively, the interventions they are required to give, in line with the NICE guidelines on non-complex fractures, complex fractures, major trauma and spinal injury assessment.

1.9.1 Enable each healthcare professional and practitioner who delivers care to patients with trauma to have up-to-date training in the interventions they are required to give.

1.9.2 Provide education and training courses for healthcare professionals and practitioners who deliver care to children with major trauma that include the following components:

- safeguarding
- taking into account the radiation risk of CT to children when discussing imaging for them
- the importance of the major trauma team, the roles of team members and the team leader, and working effectively in a major trauma team
- managing distressed relatives and breaking bad news
- the importance of clinical audit and case review.

To find out what NICE has said on topics related to this guideline, see our web page on injuries, accidents and wounds.

Implementation: getting started

This section will be completed in the final guideline using information provided by stakeholders during consultation.

To help us complete this section, please use the stakeholder comments form to give us your views on these questions:

1. Which areas will have the biggest impact on practice and be challenging to implement? Please say for whom and why.

2. What would help users overcome any challenges? (For example, existing practical resources or national initiatives, or examples of good practice.)

Context

In its 2010 report Major trauma care in England the National Audit Office estimated that there are 20,000 cases of major trauma per year in England. Each year 5,400 people die of their injuries and many others sustain permanent disability. Every trauma death costs the nation in excess of £0.75 million and every major injury £50,000.

Regional trauma networks were developed across England from April 2012. Within these networks major trauma centres provide specialised care for patients with multiple, complex and serious major trauma injuries, working closely with local trauma units.

The initial assessment of a patient with major trauma is directed at rapid identification of life-threatening or life-changing injuries. Clinicians conduct a rapid primary survey using a prioritising sequence, such as <C>ABCDE (catastrophic haemorrhage, airway with in-line spinal immobilisation, breathing, circulation, disability (neurological) and exposure and environment). People with suspected major trauma are usually taken to the nearest major trauma centre for management.

This guideline covers the initial assessment and management of major trauma, including airway, breathing and ventilation, circulation, haemorrhage and temperature control. It provides recommendations on:

- airway management
- management of chest trauma
- management of haemorrhage
- imaging
- documentation
- information and support for patients with major trauma and their families and carers.

Recommendations for research

The Guideline Committee has made the following recommendations for research.

1 Point-of-care coagulation testing

What is the clinical and cost effectiveness of point-of-care coagulation testing using rotational thromboelastrometry (ROTEM) or thromboelastography (TEG) to target treatment, compared with standard laboratory coagulation testing?

Why this is important

More rapid treatment of coagulopathy could reduce mortality from haemorrhage, which is the main cause of death in patients with major trauma. Point-of-care ROTEM and TEG are complex diagnostic tools used to detect coagulopathy. They are used successfully in surgery and intensive care settings. It is thought they might also be effective in targeting treatment for coagulopathy in the resuscitation room.

Point-of-care ROTEM and TEG are faster to perform than standard laboratory tests and enable an earlier transition from an initial fixed-ratio protocol to a protocol guided by laboratory coagulation results. These results can be updated as often as every 15 minutes, which could enable treatment to be adjusted rapidly and targeted effectively. This could result in reduced use of blood products and other treatments for coagulopathy.

The costs of point-of-care ROTEM and TEG could be offset by the changes in management they lead to, which could be lifesaving, and by avoidance of unnecessary transfusions.

2 Lactate level as a measure of shock

Is lactate monitoring in patients with major trauma clinically and cost effective?

Why this is important

In current practice, treatment for hypovolaemic shock is guided by the patient's haemodynamic levels, including heart rate and blood pressure.

However, haemodynamic levels such as blood pressure tend to change late and correct early, so may not accurately indicate continuing shock. Research has found a strong correlation between lactate levels and the presence of shock. Lactate level may therefore be a more responsive indicator of shock that could be used to guide treatment.

3 Morphine compared with ketamine for first-line management of pain

Is morphine clinically and cost effective compared with ketamine for first-line pharmacological pain management (in both pre-hospital and hospital settings) in patients with major trauma?

Why this is important

The use of opioids as first-line analgesics after major trauma is well established but has been associated with negative side effects. Consequently, intravenous ketamine in sub-anaesthetic doses is often used for analgesia in pre-hospital and hospital settings. Some studies have suggested that intravenous morphine in combination with ketamine provides more effective analgesia than morphine alone. However, there is little evidence from well-controlled trials that directly compares the effectiveness and side effects of morphine and ketamine.

4 Warming in patients with major trauma

Is warming clinically and cost effective in patients with major trauma? If so, which groups of patients will benefit from warming and what is the best method of warming?

Why this is important

After major trauma, patients are often exposed to adverse weather conditions and are at risk of developing hypothermia, which is associated with worse outcomes including higher mortality. However, there is uncertainty about the clinical benefit of warming patients and whether all groups of patients would benefit from warming. In addition, there is a wide range of methods used for

warming and little evidence showing their comparative effectiveness, particularly in pre-hospital settings.