Fractures (complex): assessment and management

NICE guideline: short version

Draft for consultation, August 2015

This guideline covers the assessment and management of complex fractures in children (under 16s) and adults (over 16s). It includes recommendations on:

- management in pre-hospital settings
- immediate destination of patients
- initial assessment and management in acute care
- imaging and haemorrhage control of pelvic fractures
- management of open fractures
- management plan and referral for pilon fractures
- documentation
- information and support.

The guideline does not cover all situations for every individual complex fracture. It is based around 3 topics that should be considered as representative of an evidence-based guide to the general management of complex fractures and it provides recommendations on open fractures, pelvic fractures and pilon fractures for areas in which guidance is needed. It does not cover non-complex fractures, skull fractures and spinal injuries. These are covered by other NICE guidelines.

Who is it for?

- Healthcare professionals and healthcare practitioners who deliver care for people with complex fractures
- Providers of NHS services for people with complex fractures
- Commissioners of NHS services for people with complex fractures
- People with complex fractures, their families and carers.

This version of the guideline contains the recommendations, context and recommendations for research. The 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.

How to use NICE guidelines 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. Some recommendations on management depend on whether the growth plate of the injured bone has closed (skeletal maturity). The age at which this happens varies. In practice, healthcare professionals use clinical judgement to determine skeletal maturity. When a recommendation depends on skeletal maturity this is clearly indicated.

1.1 Pre-hospital settings

1.1.1 For recommendations on managing airways, recognising and managing chest trauma, controlling external haemorrhage and fluid replacement, see our draft guideline on major trauma.

Initial pharmacological management of pain

1.1.2 For recommendations on the initial pharmacological management of pain in people with suspected open fractures, see our draft guideline on major trauma.

1.1.3 For recommendations on the initial pharmacological management of pain in people with suspected high-energy pelvic fractures, see our draft guideline on major trauma.

1.1.4 For recommendations on the initial pharmacological management of pain in adults with suspected low-energy pelvic fractures, see the NICE guideline on hip fracture (CG124).

1.1.5 For recommendations on the initial pharmacological management of pain in people with suspected pilon fractures, see our draft guideline on non-complex fractures.

Using a pelvic binder

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

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

1.1.8 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.

Initial management of open fractures before debridement

1.1.9 Do not irrigate open fractures of the long bones, hindfoot or midfoot in pre-hospital settings.

1.1.10 Consider a saline-soaked dressing covered with an occlusive layer for open fractures in pre-hospital settings.

1.1.11 In the pre-hospital setting, administer prophylactic intravenous antibiotics within 1 hour of injury to people with open fractures without delaying transport to hospital.

Splinting long bone fractures in the pre-hospital setting

1.1.12 In the pre-hospital setting, consider the following for people with suspected long bone fractures of the legs:

- a traction splint or adjacent leg as a splint if the suspected fracture is above the knee
- a vacuum splint for all other suspected long bone fractures.

Destination for people with suspected fractures

1.1.13 Transport people with suspected open fractures:

- directly to a major trauma centre or specialist centre for orthoplastic care if a long bone, hindfoot or midfoot are involved, or
- to the nearest trauma unit or emergency department if the suspected fracture is in the hand, wrist or toes, unless there are pre-hospital triage indications for direct transport to a major trauma centre.

1.1.14 Transport people with suspected pelvic fractures to the nearest hospital unless there are pre-hospital triage indications for direct transport to a major trauma centre.

1.2 Hospital settings

See recommendations 1.1.2 to 1.1.5 for advice on initial management of pain.

Vascular injury

1.2.1 Use hard signs (loss of palpable pulse, continued blood loss, or expanding haematoma) to diagnose vascular injury.

1.2.2 Do not rely on capillary return or Doppler signal to exclude vascular injury.

1.2.3 Perform immediate surgical exploration if hard signs of vascular injury persist after any necessary restoration of limb alignment and joint reduction.

1.2.4 In people with a devascularised limb following long bone fracture, use a vascular shunt as the first surgical intervention before skeletal stabilisation and definitive vascular reconstruction.

1.2.5 Do not delay revascularisation for angiography.

1.2.6 For humeral supracondylar fractures in children (under 16s) with a vascular injury but a well-perfused hand, consider observation rather than immediate vascular intervention.

Compartment syndrome

1.2.7 In people with fractures of the tibia, maintain awareness of compartment syndrome for 48 hours after injury or fixation by:

- regularly assessing clinical symptoms and signs in hospital
- considering continuous compartment pressure monitoring in hospital when clinical symptoms and signs cannot be readily identified
- advising people how to self-monitor for symptoms of compartment syndrome, when they leave hospital.

Whole-body CT

1.2.8 Use whole-body CT (consisting of a vertex-to-toes scanogram followed by CT from vertex to mid-thigh) in adults (over 16s) with blunt major trauma and suspected multiple injuries.

1.2.9 Use clinical findings and the scanogram to direct CT of the limbs in adults (over 16s) with limb trauma.

1.2.10 Do not routinely use whole-body CT to image children (under 16s). Use clinical judgement to limit CT to the body areas where assessment is needed.

Pelvic fractures

Transfer to a major trauma centre or specialist centre

1.2.11 Immediately transfer people with haemodynamic instability and pelvic or acetabular fractures to a major trauma centre for definitive treatment of active bleeding.

1.2.12 Transfer people with pelvic or acetabular fractures needing specialist pelvic reconstruction to a major trauma centre or specialist centre within 24 hours of injury.

1.2.13 Immediately transfer people with a failed closed reduction of a native hip to a specialist centre if there is insufficient expertise for open reduction at the receiving hospital.

Pelvic imaging

1.2.14 Use CT for first-line imaging in adults (over 16s) with suspected high-energy pelvic fractures.

1.2.15 For first-line imaging in children (under 16s) with suspected high-energy pelvic fractures:

- use CT rather than X-ray when CT of the abdomen or pelvis is already indicated for assessing other injuries
- consider CT rather than X-ray in other situations.

Use clinical judgement to limit CT to the body areas where assessment is needed.

Controlling pelvic haemorrhage

Our draft guideline on trauma: service delivery contains recommendations for ambulance and hospital trust boards, senior managers and commissioners on interventional radiology.

1.2.16 For first-line invasive treatment of active arterial pelvic haemorrhage, use:

- interventional radiology if emergency laparotomy is not needed for abdominal injuries
- pelvic packing if emergency laparotomy is needed for abdominal injuries.

Removing a pelvic binder

1.2.17 For people with suspected pelvic fractures and pelvic binders:

- remove the pelvic binder if there is no pelvic fracture or a pelvic fracture is identified as stable
- agree with the pelvic surgeon before removing the pelvic binder how an unstable fracture should be managed
- think about removing the pelvic binder in all people within 24 hours of application, to reduce the risk of skin pressure damage.

Log rolling

1.2.18 Do not log roll people with suspected pelvic fractures before pelvic imaging unless:

- an occult penetrating injury is suspected in a person with haemodynamic instability
- log rolling is needed to clear the airway (for example, suction is ineffective in a person who is vomiting).

When log rolling, pay particular attention to haemodynamic stability.

Open fractures

Management of open fractures before debridement

1.2.19 Do not irrigate open fractures of the long bones, hindfoot or midfoot in the emergency department before debridement.

1.2.20 Consider a saline-soaked dressing covered with an occlusive layer (if not already applied) for open fractures in the emergency department before debridement.

1.2.21 In the emergency department, administer prophylactic intravenous antibiotics immediately to people with open fractures if not already given.

Limb salvage

1.2.22 Do not base the decision to amputate on an injury severity tool score.

1.2.23 Perform primary amputation when:

- a limb is the source of uncontrollable life-threatening bleeding, or
- a limb is salvageable but attempted preservation would pose an unacceptable risk to the person's life, or
- a limb is deemed unsalvageable after orthoplastic assessment.

1.2.24 Base the decision whether to perform secondary amputation on multidisciplinary assessment involving an orthopaedic surgeon, a plastic surgeon, a rehabilitation specialist and the person and their family members or carers (as appropriate).

1.2.25 When indicated, perform the secondary amputation within 72 hours of injury.

Debridement, staging of fixation and cover

1.2.26 Surgery to achieve debridement, fixation and cover of open fractures should be performed concurrently by consultants in orthopaedic and plastic surgery (a combined orthoplastic approach).

1.2.27 Perform debridement:

- immediately for highly contaminated open fractures
- within 12 hours of injury for high-energy open fractures (likely Gustilo–Anderson classification type IIIA or type IIIB) that are not highly contaminated
- within 24 hours of injury for all other open fractures.

1.2.28 Perform fixation and definitive soft tissue cover:

- at the same time as debridement if the next orthoplastic list allows this within the time to debridement recommended in 1.2.27, or
- within 72 hours of injury if definitive soft tissue cover cannot be performed at the time of debridement.

1.2.29 When internal fixation is used, perform definitive soft tissue cover at the same time.

1.2.30 Consider negative pressure wound therapy after debridement if immediate definitive soft tissue cover has not been performed.

Pilon fractures

Management in adults (skeletally mature)

1.2.31 Create a definitive management plan and perform initial surgery (temporary or definitive) within 24 hours of injury in adults (skeletally mature) with displaced pilon fractures.

1.2.32 If a definitive management plan and initial surgery cannot be performed at the receiving hospital within 24 hours of injury, transfer adults (skeletally mature) with displaced pilon fractures to a specialist centre (ideally this would be emergency department to emergency department transfer to avoid delay).

1.2.33 Immediately transfer adults (skeletally mature) with displaced pilon fractures to an orthoplastic centre if there are wound complications.

Management in children (skeletally immature)

1.2.34 Create a definitive management plan involving a children's orthopaedic trauma specialist within 24 hours of diagnosis in children (skeletally immature) with intra-articular distal tibia fractures.

1.2.35 If a definitive management plan and surgery cannot be performed at the receiving hospital, transfer children (skeletally immature) with intra-articular distal tibia fractures to a centre with a children's orthopaedic trauma specialist (ideally this would be emergency department to emergency department transfer to avoid delay).

1.3 Documentation

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

1.3.1 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.

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

1.3.3 Produce 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 condition changes
- readily available in the patient's records
- sent to the patient's GP on discharge.

Photographic documentation of open fracture wounds

1.3.4 Trusts must have information governance policies in place that enable staff to take and use photographs of open fracture wounds for clinical decision-making 24 hours a day. Protocols must also cover the handling and storage of photographic images of open fracture wounds.

1.3.5 Consider photographing open fracture wounds when they are first exposed for clinical care before debridement and at other key stages of management.

1.3.6 Keep any photographs of open fracture wounds in the patient's records.

Documentation of neurovascular status

1.3.7 When assessing neurovascular status in a person with a limb injury, document for both limbs:

- which nerves and nerve function have been assessed and when
- the findings, including:
  - sensibility
  - motor function using the MRC grading system
- which pulses have been assessed and when
- how circulation has been assessed when pulses are not accessible.

Document each repeated assessment.

1.4 Information and support for patients, family members and carers

Our 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

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

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

Support for children and vulnerable adults

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

1.4.4 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.

1.4.5 For children and vulnerable adults with complex fractures, enable parents and carers to remain within eyesight if appropriate.

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

1.4.7 Include siblings of an injured child when offering support to family members and carers.

Support for people having procedures

1.4.8 Reassure people while they are having procedures for fractures under local and regional anaesthesia.

Providing information

1.4.9 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.

1.4.10 Offer people with fractures the opportunity to see images of their injury, taken before and after treatment.

1.4.11 Provide both verbal and written information on the following, where applicable, when the management plan is agreed for people with fractures:

- 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 and psychological effects)
- amputation, if this is a possibility
- activities they can do to help themselves
- home care options, if needed
- rehabilitation, including whom to contact and how (this should include information on the importance of active patient participation for achieving goals and the expectations of rehabilitation)
- mobilisation and weight-bearing, including upper limb load bearing for arm fractures.

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

1.4.13 Ensure that all health and social care practitioners have access to information previously given to people with fractures to enable consistent information to be provided.

1.4.14 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

1.4.15 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

1.4.16 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

1.5 Training and skills

These recommendations are for ambulance and hospital trust boards, and senior managers within trauma networks.

1.5.1 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, major trauma services and spinal injury assessment.

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

You can also see this guideline in the NICE pathway on [pathway title].

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

Complex fractures make up the minority of the 1.8 million fractures that occur in England each year, but are associated with considerable morbidity and are a large burden on healthcare resources. The treatment of complex fractures is often complicated and usually involves multiple healthcare professionals and specialists.

This guideline covers the triage, initial and acute stage assessment and management, imaging, referral to specialist care and treatment of complex fractures in children (under 16s) and adults (over 16s). It includes recommendations in the following key clinical areas:

- management in pre-hospital settings
- immediate destination of patients

- initial assessment and management in acute care
- imaging and haemorrhage control of pelvic fractures
- management of open fractures
- management plan and referral for pilon fractures
- documentation
- information and support for people with complex fractures and their families and carers.

The guideline does not address all potential situations for every individual complex fracture. It is based around 3 topics that should be considered as representative of an evidence-based guide to the general management of complex fractures and it provides recommendations on open fractures, pelvic fractures and pilon fractures for areas in which guidance is needed. It does not cover the prevention and follow-up of complex fractures, and the management and follow-up of dislocations and conditions such as osteoporosis and osteoarthritis.

The guideline does not cover non-complex fractures, skull fractures, hip fractures and spinal injuries. These are covered by other NICE guidelines.

Recommendations for research

The Guideline Committee has made the following recommendations for research.

1 Cystourethrogram

How accurate is the first CT scan with contrast (trauma scan) for detecting bladder injuries in people with suspected bladder injuries after a traumatic incident?

Why this is important

Bladder injuries usually occur in people with high-energy pelvic fractures after a traumatic incident. Currently people with suspected bladder injuries have a CT scan with intravenous contrast (a trauma scan) to diagnose non-bladder injuries. People who do not have injuries needing urgent treatment may then

either be given another CT scan or a fluoroscopic cystogram to check for bladder injury. People with injuries needing urgent treatment (for example, bleeding or a neurological injury) are taken to the resuscitation room after the initial CT scan (trauma scan). Once the person's condition is stabilised they are taken to either the CT or fluoroscopy suite for a retrograde cystogram to check for bladder injury. The Guideline Committee agreed that these strategies are accurate for the diagnosis of bladder injuries, but felt that there were advantages to a strategy that did not involve a second set of images. The Guideline Comittee was interested in whether the first CT scan with intravenous contrast (trauma scan) could accurately diagnose bladder injuries.

2 Pilon fractures

In adults with closed pilon fractures, what method of fixation provides the best clinical and cost effectiveness outcomes as assessed by function and incidence of major complications at 2 years (stratified for timing of definitive surgery early [under 36 hours] versus later [over 36 hours])?

Why this is important

Pilon fractures involve a significant proportion of the weight-bearing surface of the distal tibia. The damaged joint surface is vulnerable to degeneration. Therefore, the injury can lead to long-term disability, most commonly arthritis with pain and stiffness. Surgery can improve outcomes, allowing reduction and fixation of the fracture and early movement of the ankle joint. However, it has a high incidence of serious complications, particularly related to the vulnerability of the soft tissues around the ankle. The potential for life-changing adverse consequences of both the injury and its treatment is known, but the best management strategy to minimise these consequences is unclear.

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