NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

Health and social care directorate

Quality standards and indicators

Briefing paper

Quality standard topic: Trauma

Output: Prioritised quality improvement areas for development.

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Contents

1 Introduction

This briefing paper presents a structured overview of potential quality improvement areas for Trauma. It provides the committee with a basis for discussing and prioritising quality improvement areas for development into draft quality statements and measures for public consultation.

1.1 Structure

This briefing paper includes a brief description of the topic, a summary of each of the suggested quality improvement areas and supporting information.

If relevant, recommendations selected from the key development source below are included to help the committee in considering potential statements and measures.

1.2 Development sources

The key development sources referenced in this briefing paper are:

- Spinal injury: assessment and initial management (2016) NICE Guideline NG41
- Major trauma: service delivery (2016) NICE guideline NG40
- Major trauma: assessment and initial management (2016) NICE guideline NG39
- Fractures (non-complex): assessment and management (2016) NICE guideline NG38
- Fractures (complex): assessment and management (2016) NICE guideline NG37

2 Overview

2.1 Focus of quality standard

This quality standard will cover assessment and management of trauma (complex fractures, non-complex fractures, major trauma and spinal injury) in adults, young people and children.

The quality standard will not cover trauma resulting from burns, hip fracture or head injury. Quality standards have already been published on hip fracture in adults and head injury.

2.2 Definition

Major trauma is defined as an injury or a combination of injuries that are life-threatening and could be life changing because it may result in long-term disability.

2.3 Incidence and prevalence[1]

Trauma has a bimodal age distribution with the first peak in the under-20s and then the second peak in the over-65 age group. It is the biggest killer of people aged below 45 years in the UK and in those people that survive a traumatic injury, a large number will have permanent disabilities. The estimated costs of major trauma are between £0.3 and £0.4 billion a year in immediate treatment. The cost of any subsequent hospital treatments, rehabilitation, home care support or informal carer costs are unknown. The National Audit Office[2] estimated that the annual lost economic output as a result of major trauma is between £3.3 billion and £3.7 billion.

The National Audit Office 2010 report estimated that there are 20,000 cases of major trauma per year in England; 5,400 people die of their injuries with many others sustaining permanent disability. Data from TARNIet (children's component of the national clinical audit – the Trauma Audit Research Network) covering 183 hospitals recorded 23,771 incidents of trauma in children between 1988 and 2010. Of these, 30% were classed as major trauma, with an injury severity score of more than 15. This equates to approximately 300 children involved in major trauma in the UK per annum.

2.4 Management

Trauma Networks[3]

Regional trauma networks went live across England in April 2012. A Trauma Network (TN) is a collaboration between the providers commissioned to deliver trauma care services in a geographical area. At its heart is the 'Major Trauma Centre'. A TN should include all providers of trauma care, particularly: pre-hospital services, other hospitals receiving acute trauma admissions (Trauma Units), and rehabilitation services. The TN has appropriate links to the social care and the voluntary/community sector.

Major trauma centres (MTCs)[4]

There are 27 MTCs in England (see map of MTCs in appendix 1). Of those:

- 11 treat both adults and children
- 11 only treat adults
- 5 only treat children

[1] Unless referenced as from another source, the information in this section is from Major trauma: assessment and initial management NICE guideline NG39 (2016)
[2] National Audit Office (2010) Major trauma care in England
[3] Unless referenced as from another source, the information in this section is from Department of Health (2010) Regional Trauma Networks - Clinical Advisory Group Document
[4] Unless referenced as from another source, the information in this section is from: Major trauma: assessment and initial management NICE guideline NG39 (2016) and Urgent and emergency care services in England NHS Choices (accessed 22/08/17)

MTCs provide specialised care for patients with multiple, complex and serious major trauma injuries (injury severity score of greater than 15) and work closely with a series of local trauma units (TUs). MTCs operate 24 hours a day, seven days a week. They are staffed by consultant-led specialist teams with access to the best diagnostic and treatment facilities, including orthopaedics, neurosurgery and radiology teams.

MTCs also treat children. The management of specific injuries and drug administration will differ for children, but the focused response from the children's trauma team will essentially be the same.

Pre-hospital care[5]

Ambulance crews will make an assessment at the scene using triage tools to ensure that those with major trauma are taken directly to a MTC for urgent treatment. This may involve bypassing their local hospital so that patients can immediately receive specialist care with access to CT scans and innovative technology.

If the distances are long, patients may have to be taken to their local TU first for stabilisation before they can transfer to the MTC for definitive treatment. Once patients arrive at the trauma centre, they will immediately undergo a full assessment by a consultant-led trauma team trained to deal with these types of injuries.

Good trauma care involves getting the patient to the right place at the right time for the right care. This means:

- having the seriousness of the injury identified as early as possible, ideally at the scene of the incident.
- investigations such as CT scanning should take place immediately on arrival at the first hospital.
- if the injury requires specialist care, the patient should be moved to a MTC as quickly as possible.
- patients should have access to an appropriate programme of rehabilitation to assist their recovery.

The early identification of life threatening conditions and appropriate rapid interventions can be lifesaving. Good early interventions for all injuries speeds recovery, prevents complications and allows an earlier return to active life. However, late identification of injuries (both major and minor), inadequate investigation and imaging of such injuries and late or poor treatment substantially increases both mortality and morbidity[6].

[5] Unless referenced as from another source, the information in this section is from Urgent and emergency care services in England NHS Choices (accessed 22/08/17)
[6] Major trauma: final scope NICE (2014)

2.5 National outcome frameworks

Tables 1 and 2 show the outcomes, overarching indicators and improvement areas from the frameworks that the quality standard could contribute to achieving.

Table 1 NHS outcomes framework 2016–17

Domain	Overarching indicators and improvement areas
3 Helping people to recover from episodes of ill health or following injury	***Overarching indicators*** 3a Emergency admissions for acute conditions that should not usually require hospital admission 3b Emergency readmissions within 30 days of discharge from hospital* ***Improvement areas*** **Improving recovery from injuries and trauma** *3.3 Survival from major trauma*
4 Ensuring that people have a positive experience of care	***Overarching indicators*** 4b Patient experience of hospital care 4c *Friends and family test* *4d Patient experience characterised as poor or worse* *ii Hospital care* ***Improvement areas*** **Improving people's experience of accident and emergency services** 4.3 Patient experience of A&E services **Improving people's experience of integrated care** *4.9 People's experience of integrated care*
Alignment with Adult Social Care Outcomes Framework and/or Public Health Outcomes Framework * Indicator is shared Indicators in italics in development	

Table 2 Public health outcomes framework for England, 2016–2019

Domain	Objectives and indicators
4 Healthcare public health and preventing premature mortality	***Objective*** Reduced numbers of people living with preventable ill health and people dying prematurely, whilst reducing the gap between communities ***Indicators*** 4.11 Emergency readmissions within 30 days of discharge from hospital*
Alignment with Adult Social Care Outcomes Framework and/or NHS Outcomes Framework * Indicator is shared	

3 Summary of suggestions

3.1 Responses

In total 20 stakeholders responded to the 2-week engagement exercise 16/06/17 to 30/06/17.

Stakeholders were asked to suggest up to 5 areas for quality improvement. Specialist committee members were also invited to provide suggestions. The responses have been merged and summarised in table 3 for further consideration by the Committee.

Full details of all the suggestions provided are given in appendix 3 for information.

Table 3 Summary of suggested quality improvement areas

Suggested area for improvement	Stakeholders
Organisation of services • Pre-hospital triage • Transfer • Organisation and access to services	 • FICM/ICS, RCN, RCSE, SCM 1, SCM 2 • RCEM, RCSE, SCM 1, SCM 2, SCM 3 • FICM/ICS, NHS E, RCSE
Airway management	• CP, EMRTS, RCA, RCEM, RCGP, SCM 1, SCM 3
Management of haemorrhage • Fluid replacement • Haemostatic agents • Haemorrhage protocols	 • DM, NHS NBT/NBTC, RCA, RCEM, RCN • NHS NBT/NBTC, SCM 3 • NHS NBT/NBTC, SCM 3
Radiology • Access and use • Image reporting	 • BSIR, DM, SCR, SCM 2, SCM 3, SCM 4 • SCM 4, SCR
Pain management	• RCA, RCGP
Spinal injury and fractures • Spinal immobilisation • Pelvic fracture • Open fracture	 • SCM 2 • CP, SCM 1 • CP, SCM 4
Information and support for patients, family members and carers	• SCM 1, SCM 5
Additional Areas • Data submission to TARN • Distal femoral fractures and hip fracture • Orthogeriatric review for elderly patients • Evidence on pre-hospital medical care • Injury prevention programmes • Radiographer-led discharge • Staff training • Helicopter emergency medical systems • Sepsis	 • RCEM, RCN, SCM 3 • RCN, WUTH • RCEM • CP, FICM/ICS • FICM/ICS • SCR • NHS E, RCN, RCSE • RCUK • DM

BSIR, British Society of Interventional Radiology
CP, College of Paramedics
DM, Deltex Medical
EMRTS, Emergency Medical Retrieval and Transfer Service
FICM/ICS, Faculty of Intensive Care Medicine/Intensive Care Society
NHS E, NHS England
NHS NBT/NBTC, NHS Blood and Transplant and National Blood Transfusion Committee
RCA, Royal College of Anaesthetists
RCUK, Resuscitation Council (UK)
RCEM, Royal College of Emergency Medicine
RCGP, Royal College of General Practitioners
RCN, Royal College of Nursing
RCSE, The Royal College of Surgeons of Edinburgh
SCM, Specialist Committee Member
SCR, Society and College of Radiographers
WUTH, Wirral University Teaching Hospital

3.2 Identification of current practice evidence

Bibliographic databases were searched to identify examples of current practice in UK health and social care settings; 3259 papers were identified for trauma. In addition, 35 papers were suggested by stakeholders at topic engagement and 2 papers internally at project scoping.

Of these papers, 9 have been included in this report and are included in the current practice sections where relevant. Appendix 2 outlines the search process.

4 Suggested improvement areas

4.1 Organisation of services

4.1.1 Summary of suggestions

Pre-hospital triage

Stakeholders raised the importance of early and accurate triage of trauma patients to ensure that they receive the right care in the right place (MTC or TU). In particular stakeholders felt that improving recognition of trauma in older people was important, so that decisions about management are made earlier, to improve outcomes. The use of a trauma triage tool and checking Airway, Breathing, Circulation, Disability and Exposure (ABCDE) to initially assess patients was also raised.

Transfer

Stakeholders highlighted that the timing of transfers between TUs and MTCs is critical to ensure timely management of injuries and better patient outcomes. It was suggested that there are currently delays in arranging and undertaking transfers.

Organisation and access to services

Stakeholders raised issues around having appropriate numbers of staff with the right skills in emergency departments (EDs), particularly due to gaps in rotas, as well as issues with how trauma teams are organised. A lack of resources was also mentioned, including the availability of beds, rehabilitation services, staff training and appropriate aftercare.

4.1.2 Selected recommendations from development sources

Table 4 below highlights recommendations that have been provisionally selected from the development sources that may support potential statement development. These are presented in full after table 4 to help inform the committee's discussion.

Table 4 Specific areas for quality improvement

Suggested quality improvement area	Suggested source guidance recommendations
Pre-hospital triage	**Recording information in pre‑hospital settings** NICE NG39 Recommendation 1.8.1 **Pre-hospital triage** NICE NG40 Recommendations 1.1.1 - 1.1.3
Transfer	**Transfer between emergency departments** NICE NG40 Recommendations 1.5.1, 1.5.3 and 1.5.4

Organisation and access to services	**Procedures for receiving patients in trauma units and major trauma centres** NICE NG40 Recommendations 1.4.1, 1.4.2, 1.4.3 and 1.4.5 **Organisation of hospital major trauma services** NICE NG40 Recommendation 1.6.2 **Access to major trauma services** NICE NG40 Recommendation 1.11.1

Pre-hospital triage

Recording information in pre-hospital settings

NICE NG39 Recommendation 1.8.1

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

- catastrophic haemorrhage
- airway with in line spinal immobilisation
- breathing
- circulation
- disability (neurological)
- exposure and environment

(<C>ABCDE).

Pre-hospital triage

NICE NG40 – Recommendation 1.1.1

Provide a pre-hospital major trauma triage tool to differentiate between patients who should be taken to a major trauma centre and those who should be taken to a trauma unit for definitive management.

NICE NG40 – Recommendation 1.1.2

Choose a pre-hospital major trauma triage tool that includes assessment of physiology and anatomical injury and takes into account the different needs of older patients, children and other high-risk populations (such as patients who take anticoagulants, pregnant women and patients with comorbidities).

NICE NG40 – Recommendation 1.1.3

Support pre-hospital care providers using the major trauma triage tool with immediate clinical advice from the ambulance control centre.

Transfer

Transfer between emergency departments

NICE NG40 – Recommendation 1.5.1

Provide a protocol for the safe and rapid transfer of patients who need definitive specialist intervention.

NICE NG40 – Recommendation 1.5.3

Review the transfer protocol regularly.

NICE NG40 – Recommendation 1.5.4

Ensure that patients with major trauma who need critical interventions at a major trauma centre leave the sending emergency department within 30 minutes of the decision to transfer.

Organisation and access to services

Procedures for receiving patients in trauma units and major trauma centres - Recommendations for senior managers in trauma units

NICE NG40 – Recommendation 1.4.1

Ensure that multispecialty trauma teams are activated immediately in trauma units to receive patients with major trauma.

NICE NG40 – Recommendation 1.4.2

Do not use a tiered team response in trauma units.

NICE NG40 – Recommendation 1.4.3

Have a paediatric trauma team available immediately for children (under 16s) with major trauma.

Procedures for receiving patients in trauma units and major trauma centres - Recommendations for senior managers and senior doctors and nurses in major trauma centres

NICE NG40 – Recommendation 1.4.5

Have a paediatric trauma team available immediately for children (under 16s) with major trauma.

Organisation of hospital major trauma services - Recommendations for hospital trust boards, senior managers and commissioners

NICE NG40 – Recommendation 1.6.2

Provide a dedicated major trauma service for patients with major trauma that consists of:

- a dedicated trauma ward for patients with multisystem injuries
- a designated consultant available to contact 24 hours a day, 7 days a week who has responsibility and authority for the hospital trauma service and leads the multidisciplinary team care
- acute specialist trauma rehabilitation services
- acute specialist services for the paediatric and elderly populations
- a named member of clinical staff (a key worker, often a senior nurse) assigned at each stage of the care pathway who coordinates the patient's care.

Access to major trauma services - Recommendation for ambulance and hospital trust boards, senior managers and commissioners

NICE NG40 – Recommendation 1.11.1

Ensure that people with major trauma have access to services that can provide the interventions recommended in this guideline and in the NICE guidelines on non-complex fractures, complex fractures, major trauma and spinal injury. See the appendix for the recommendations for pre-hospital and hospital management of major trauma that might have particular implications for service delivery.

4.1.3 Current UK practice

Pre-hospital triage

The Major Trauma 2015 national peer review[7] summarises the findings of peer review visit reports for Major Trauma Services completed between January and March 2015. All services undertook a self-assessment of their own service and were then subject to an external peer review visit by the National Peer Review team. The report includes compliance levels for 11 Ambulance Services assessed against the following pre-hospital care measure:

- A trauma triage tool should be used to identify patients with major trauma. There should be a policy whereby:
  - all major trauma patients within 45 minutes travelling time are taken directly to the MTC bypassing other units;

[7] NHS England (2015) National peer review report: Major Trauma 2015

- major trauma patients outside of 45 minutes travelling time or critically unstable should be taken to the nearest TU for assessment and immediate resuscitation and then transferred to the MTC if needed.

Compliance was 100%.

A retrospective observational study of Trauma Audit and Research Network (TARN) data from 2012 to 2014 looked at variations in practice in UK trauma hospitals in the use of whole-body computed tomography in major trauma[8]. It found that only 89.9% of triage-positive patients (those fulfilling the criteria for direct admission to a MTC from the site of injury) were admitted directly to an MTC, while 37.7% of triage-negative patients were also admitted directly to an MTC. 63.2% of patients did not have their triage category recorded.

TARN's Major trauma in older people report (2017)[9] looked at the demographics, injury characteristics and care provided to 8176 patients aged 60 and over with Injury Severity Score (ISS) greater than 15 who were admitted between 1st January and 31st December 2014. It found that:

- pre-hospital triage is far less reliably applied to older people. Few older people with major trauma are triage-positive
- pre-hospital triage status is not recorded in many older people, possibly because pre-hospital providers do not always consider major trauma as a potential diagnosis in this group
- low levels of positive triage lead to correspondingly low levels of diversion to a MTC, pre-alert to the ED and trauma team activation. These patients are also often treated by more junior staff when they arrive at hospital.

These findings are demonstrated in table 5.

[8] Sammy et al (2017) The use of whole-body computed tomography in major trauma: variations in practice in UK trauma hospitals Emergency Medicine Journal. Published Online First: 27 January 2017

[9] Trauma Audit and Research Network (2017) Major Trauma in Older People

Table 5: Admissions to EDs

	Age bands (years)				
	16 - 59	60 - 69	70 - 79	80 - 89	90+
Went to ED	6798 (99%)	1643 (98%)	1855 (97%)	2534 (96%)	973 (97%)
Triage positive	2690 (40%)	440 (27%)	355 (19%)	310 (12%)	73 (8%)
Pre-alerted	4182 (62%)	800 (49%)	696 (38%)	625 (25%)	182 (19%)
Trauma Team	4423 (65%)	783 (48%)	638 (34%)	541 (21%)	133 (14%)

Number (%)

3.2% of 60 years old and older were not admitted by ED, 1.7% were admitted directly to a ward and 1.3% were inpatients in the hospital at the moment of the incident and the rest to surgery or transferred to other hospital.

Source: Trauma Audit and Research Network (2017) Major Trauma in Older People

TARN's report[10] on severely injured children (under 16 with ISS >15) treated in England and Wales between January 2013 and December 2014 reported that just under 50% of children are initially treated in a MTC, with around 40% treated in a specialist paediatric MTC. Over half are initially treated in a hospital accredited as a TU.

These findings are demonstrated in table 6.

Table 6 Type of first admitting hospital

First admitting hospital	Number of severely injured children (%)
Adult & Children's MTC*	411 (27.2%)
Adult MTC*	122 (8.1%)
Children's MTC*	195 (12.9%)
Trauma Unit	783 (51.8%)
Total	1,511 (100%)

Source: Trauma Audit and Research Network (2015) 2 Years of Severe Injury in Children

Transfer

The Major Trauma 2015 national peer review[11] reported compliance levels across trauma services against the following standards:

- network transfer protocol from TUs to MTCs: there should be a network protocol for the safe and rapid transfer of patients to specialist care that covers:
    - transfer of patients with major trauma initially taken to a local TU to a MTC after initial assessment and resuscitation;

[10] Trauma Audit and Research Network (2015) 2 Years of Severe Injury in Children
[11] NHS England (2015) National peer review report: Major Trauma 2015

- urgent transfer (within 2 calendar days) for specialist care within the network e.g. orthoplastics.

The transfer protocol should specify the following:

- transfer for adults is carried out by a team that have been trained in the transfer of patients;
- for time critical conditions, the transfer proceeds without delay;
- a structured checklist is completed for the transfer;
- standardised documentation should be used by TUs and MTCs.

There should be involvement of the regional paediatric critical care transfer service in defining the transfer protocol for children.

- Compliance for this measure was 68% for the 22 Major Trauma Networks assessed.

- the TU should agree the network protocol for the transfer of patients from TU to MTC - compliance was 79% for the 105 TUs assessed.

The peer review also identified the following issues for some TUs:

- lack of senior anaesthetic support at grade ST3 or above, also impacting on ability to transfer patients in a timely manner
- in the absence of a network wide TU to MTC transfer policy, concern over the arrangements for the time critical transfer of paediatric patients
- trauma booklet and transfer guidelines out of date, which may lead to delays in undertaking patient transfer to the MTC

A small number of TUs (9%) had immediate risks which included:

- TU with significant challenges in accessing referral pathways to the MTC for patients with spinal injury, leading to significant adverse event
- significant delays in transferring of patients that self-present with major traumas
- a TU, which lies at a significant distance from the children's MTC, does not have immediate access to appropriate ventilation equipment for the safe transfer of children.
- insufficient on-call anaesthetists to facilitate all transfers out of the trust.

TARN's report[12] on severe injury in children found that over half are still initially treated in a hospital accredited as a TU. Most children are eventually cared for in an appropriate hospital with few remaining outside of the MTCs (see table 7).

[12] Trauma Audit and Research Network (2015) 2 Years of Severe Injury in Children

Table 7 Transfer between hospitals

Type of hospital where severely injured children were admitted	Number of cases (%)
Multiple hospitals, not MTC*	62 (4.1%)
Multiple hospitals, adult MTC*	17 (1.1%)
Multiple hospitals, children's MTC*	661 (43.8%)
Single hospital, not MTC*	151 (10%)
Single hospital, adult MTC*	48 (3.2%)
Single hospital, children's MTC*	572 (37.8%)
Total	**1,511 (100%)**

Source: Trauma Audit and Research Network (2015) 2 Years of Severe Injury in Children

Confidential data from the National Clinical Audit for Major Trauma also informed the discussion.

Organisation and access to services

TARN's report[13] on severe injury in children found that 76.5% of severely injured children were resuscitated by consultants and 49% were seen by a paediatric specialist in the ED, as demonstrated in table 8.

Table 8 Most senior clinician in the ED

Direct admissions to hospital = 1,169

Most senior in ED	Number of cases (%)			
	All	Children's MTC	TU	Adult MTC
Consultant	894 (76.5%)	534 (90.1%)	269 (57.8%)	91 (82%)
Associate Specialist	34 (2.9%)		29 (6.2%)	5 (4.5%)
ST3 and above	103 (8.8%)	38 (6.4%)	58 (12.5%)	7 (6.3%)
FY / ST 1-2	76 (6.5%)	15 (2.5%)	58 (12.5%)	3 (2.7%)
Other / Not recorded	62 (5.3%)	6 (1%)	51 (11%)	5 (4.5%)
Total	**1,169 (100%)**	**593 (100%)**	**465 (100%)**	**111 (100%)**

All patients directly admitted visited the ED.

Source: Trauma Audit and Research Network (2015) 2 Years of Severe Injury in Children

[13] Trauma Audit and Research Network (2015) 2 Years of Severe Injury in Children

A survey of MTC staffing in England[14] (2015) sent out electronic surveys to all adult MTCs to establish staffing patterns, asking questions about patient volume, 'trauma call' procedures and dedicated major trauma services. Replies were received from all 22 MTCs. The results showed that:

- all 22 centres had a trauma call procedure, but in 1 of these, the response is not consultant-led.
- only 13 centres had a dedicated major trauma service or trauma surgery service, although a further 4 are currently developing such a service.
- in 7 of these 17 centres (with/developing a major trauma service), the service is or will be provided by orthopaedic surgeons, in 2 by emergency medicine departments, in another 2 by general or vascular surgeons, and in 6 by a multidisciplinary group of consultants.
- 13 centres have a dedicated ward for trauma patients.

The Major Trauma 2015 national peer review[15] reported compliance of trauma services against the following measures:

- Trauma team leader for MTCs: there should be a consultant trauma team leader with an agreed list of responsibilities who should be leading the trauma team and available 24/7. The trauma team leader should be available in 5 minutes. There should be a nurse trained in Advanced Trauma Nurse Course (ATNC) or equivalent available for major trauma 24/7.
    - 36% compliance for the 22 MTCs assessed against the adult measure
    - 53% compliance for the 15 MTCs assessed against the children's measure
- Trauma team leader for TUs: there should be a trauma team leader of ST3 or above with an agreed list of responsibilities available within 5 mins, 24/7. There should also be a consultant available in 30 minutes.

  The trauma team leader should have been trained in Advanced Trauma Life Support (ATLS) or equivalent.
  There should be a nurse trained in ATNC or equivalent available for major trauma 24/7.
  There should be a clinician trained in advanced paediatric life support available for children's major trauma.
    - 27% compliance for 105 TUs assessed.

The peer review also identified the following issues for some services:

TUs:

- consultants within the ED, not always attending when the trauma team has been activated to a major trauma patient.

[14] Jansen JO et al (2015) A survey of major trauma centre staffing in England. Journal of the Royal Army Medical Corps 2015;161:341–344
[15] NHS England (2015) National peer review report: Major Trauma 2015

- trauma team nurses not having attended ATNC or equivalent
- inadequate cover or attendance by adequately trained ED Consultants which could compromise the quality of care delivered
- no assurance Trauma Team Leader trained in ATLS or equivalent

Adult MTCs:

- the seniority and availability of the trauma team
- consultant trauma team leader not available within 5 minutes 24/7
- trauma team nurses not having attended ATNC or equivalent
- multiple specialties responding to major trauma calls with medical staff below ST4 level
- the absence of specialist rehabilitation facilities, including the provision of level 1 hyperacute rehabilitation beds.

Major Trauma Networks:

- severely injured patients remaining in TUs for definitive treatment and rehabilitation
- monitoring of safe transfer of patients
- inequity of access to rehabilitation services
- pathways for rehabilitation and access to specialist rehabilitation beds
- severely injured patients remaining in TUs for definitive treatment and rehabilitation.

Confidential data from the National Clinical Audit for Major Trauma also informed the discussion.

4.1.4 Resource impact assessment

There is no significant resource impact expected. However, it may be difficult for some hospitals to create a trauma ward covering all specialties on 1 site, and this may have some resource implications.

The Trauma service delivery guideline committee believed that where models of multidisciplinary care have already been introduced, healthcare staff would need to be organised differently rather than increase their numbers.

4.2 Airway management

4.2.1 Summary of suggestions

Stakeholders highlighted that rapid sequence induction (RSI) to secure the airway in patients should be performed within 45 minutes of the call to the emergency services to give better outcomes. Stakeholders felt that this is not always being done by adequately trained staff and is not available in some areas. Stakeholders also mentioned the need for faster decisions on whether to perform this at the scene or transport patients to MTCs to prevent delays in treatment.

4.2.2 Selected recommendations from development sources

Table 9 below highlights recommendations that have been provisionally selected from the development sources that may support potential statement development. These are presented in full after table 9 to help inform the committee's discussion.

Table 9 Specific areas for quality improvement

Suggested quality improvement area	Selected source guidance recommendations
Airway management	**Airway management in pre-hospital and hospital settings** NICE NG39 Recommendations 1.2.1-1.2.3 **Transferring patients with major trauma** NICE NG40 Recommendation 1.2.3 **Access to major trauma services** NICE NG39 Recommendation 1.11.2

Airway management in pre-hospital and hospital settings

The NICE guideline on major 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.

NICE NG39 – Recommendation 1.2.1

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.

NICE NG39 – Recommendation 1.2.2

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

NICE NG39 – Recommendation 1.2.3

Aim to perform RSI as soon as possible and within 45 minutes of the initial call to the emergency services, preferably at the scene of the incident.

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 MTC for RSI provided the journey time is 60 minutes or less
- only divert to a trauma unit for RSI before onward transfer if a patent airway cannot be maintained or the journey time to a MTC is more than 60 minutes.

Transferring patients with major trauma

NICE NG40 – Recommendation 1.2.3

Divert to the nearest trauma unit if a patient with major trauma needs a life-saving intervention, such as drug-assisted rapid sequence induction of anaesthesia and intubation, that cannot be delivered by the pre-hospital team.

Access to major trauma services

NICE NG40 – Recommendation 1.11.2

Ensure that drug-assisted rapid sequence induction of anaesthesia and intubation (RSI) is available for patients with major trauma who cannot maintain their airway and/or ventilation, and be aware that RSI should:

- be performed as soon as possible and within 45 minutes of the initial call to the emergency services and
- preferably be provided at the scene of the incident and not by diverting to a trauma unit.

4.2.3 Current UK practice

TARN's report[16] on severe injury in children reported that 38% of children admitted to hospital in 2013-14 (1,169 admissions) had definitive airway management (defined as intubation, cricothyroidotomy or tracheostomy). Of those, 30% (131) were carried out pre-hospital and 70% (313) in the ED. The median hours to definitive airway management from incident was 1.2 hours (range 0.8 to 1.6).

[16] Trauma Audit and Research Network (2015) 2 Years of Severe Injury in Children

A study of prehospital records for trauma patients at a MTC in Birmingham from 2010 to 2015[17] concluded that following the establishment of the regional Major Trauma Network, there was increased frequency of RSI for at-risk trauma patients at times when there may previously have been an unmet requirement. RSI was performed in 9.4% of missions after compared with 5.2% previously. Successful tracheal intubation was achieved in 99% of occasions.

Confidential data from the National Clinical Audit for Major Trauma also informed the discussion.

4.2.4 Resource impact assessment

Resource impact at time of guidance publication highlighted that there might be a resource impact from the commissioning cost to ensure the service is universally available. There may be costs associated with setting up a formal system in some areas, with doctors trained in prehospital emergency medicine being identified and affiliated to the ambulance service.

The recommendations should encourage more efficient dispatching and healthcare professionals with the correct skills responding first.

[17] Naumann et al (2017) Prehospital rapid sequence induction following trauma in the era of regional networks for major trauma. Naumann et al Eur J Emerg Med.

4.3 Management of haemorrhage

4.3.1 Summary of suggestions

Fluid replacement

Stakeholders highlighted the importance of safe and timely fluid management in trauma to improve patient outcomes and prevent complications, such as the development of acute kidney injury. Stakeholders felt that there is variation in practice in following the guidance on using a ratio of 1 unit of plasma to 1 unit of red blood cells to replace fluid volume and avoiding the use of crystalloids.

Haemostatic agents

Stakeholders highlighted that tranexamic acid should be given to patients with major trauma or active bleeding within 3 hours of injury, but feel that there is variation in its usage and how quickly it is administered.

Haemorrhage protocols

Stakeholders highlighted that trauma centres should have major haemorrhage protocols in place that are audited regularly, but there is variation in practice.

4.3.2 Selected recommendations from development source

Table 10 below highlights recommendations that have been provisionally selected from the development source that may support potential statement development. These are presented in full after table 10 to help inform the committee's discussion.

Table 10 Specific areas for quality improvement

Suggested quality improvement area	Selected source guidance recommendations
Fluid replacement	**Fluid replacement in pre-hospital and hospital settings** NICE NG39 Recommendations 1.5.22-1.5.25
Haemostatic agents	**Haemostatic agents in pre-hospital and hospital settings** NICE NG39 Recommendations 1.5.4 and 1.5.5
Haemorrhage protocols	**Haemorrhage protocols in hospital settings** NICE NG39 Recommendations 1.5.26 and 1.5.27

Fluid replacement

Fluid replacement in pre‑hospital and hospital settings

NICE NG39 – Recommendation 1.5.22

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

NICE NG39 – Recommendation 1.5.23

In hospital settings do not use crystalloids for patients with active bleeding. See the section on resuscitation in the NICE guideline 'Intravenous fluid therapy in adults in hospital' and the section on fluid resuscitation in the NICE guideline 'Intravenous fluid therapy in children and young people in hospital' for advice on tetrastarches.

NICE NG39 – Recommendation 1.5.24

For adults (16 or over) use a ratio of 1 unit of plasma to 1 unit of red blood cells to replace fluid volume.

NICE NG39 – Recommendation 1.5.25

For children (under 16s) use a ratio of 1 part plasma to 1 part red blood cells, and base the volume on the child's weight.

Haemostatic agents

Haemostatic agents in pre‑hospital and hospital settings

NICE NG39 – Recommendation 1.5.4

Use intravenous tranexamic acid as soon as possible in patients with major trauma and active or suspected active bleeding.

NICE NG39 – Recommendation 1.5.5

Do not use intravenous tranexamic acid more than 3 hours after injury in patients with major trauma unless there is evidence of hyperfibrinolysis.

Haemorrhage protocols

Haemorrhage protocols in hospital settings

NICE NG39 – Recommendation 1.5.26

Hospital trusts should have specific major haemorrhage protocols for adults (16 or over) and children (under 16s).

NICE NG39 – Recommendation 1.5.27

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

4.3.3 Current UK practice

Fluid replacement

An audit of the utilisation of a major haemorrhage protocol at the Royal Victoria Infirmary in Newcastle[18], a MTC, found that transfusion ratios of red cells: fresh frozen plasma were 1:3:1 in 2012-2013, 1:7:1 in 2013-14 and improved to 1:1:1 in 2014-15 following the introduction of major haemorrhage prescriptions.

Haemostatic agents

The Major Trauma 2015 national peer review[19] reported compliance levels across trauma services against the following standards:

- there should be a protocol for the administration of tranexamic acid in pre-hospital care by trained paramedics - 82% compliance for 11 Ambulance Services
- patients with significant haemorrhage should be administered tranexamic acid within 3 hours of injury and receive a second dose according to CRASH-2 protocol:
    - 95% compliance for 22 MTCs assessed against the adult measures
    - 100% compliance for 15 MTCs (including 5 dedicated paediatric MTCs) assessed against the children's measures
    - 59% compliance for the 105 TUs assessed

The peer review also identified the following issues for some TUs:

- wording on local guidance on use of tranexamic acid amended from that agreed by the network, leading to concerns that clinicians may be deterred from administering tranexamic acid to patients who require this treatment urgently
- no assurance with regard to the correct and timely administration of tranexamic acid for patients at risk of significant haemorrhage.

Confidential data from the National Clinical Audit for Major Trauma also informed the discussion.

[18] Hawes et al (2016) Using major haemorrhage prescriptions to improve delivery - a 3 year audit of utilisation of a major haemorrhage protocol in a UK major trauma centre. International Journal of Transfusion Medicine 2016 vol 111 p79

[19] NHS England (2015) National peer review report: Major Trauma 2015

Haemorrhage protocols

The Major Trauma 2015 national peer review[20] reported compliance against the following standards:

- there should be a network agreed massive transfusion protocol covering both adults and children which is used in all TUs. The protocol should include the administration of tranexamic acid and blood products including plasma, cryoprecipitate and platelets in the early stages of transfusion - 77% compliance for the 22 Major Trauma Networks assessed.
- there should be a protocol for the management of massive transfusion in patients with significant haemorrhage
    - 95% compliance for the 22 MTCs assessed against the adult measures
    - 100% compliance for the 15 MTCs (including 5 dedicated paediatric MTCs) assessed against the children's measures
- the TU should agree the network protocol for the management of massive transfusion in patients with significant haemorrhage – 64% compliance for 105 TUs assessed.

4.3.4 Resource impact assessment

There is no significant resource impact expected.

[20] NHS England (2015) National peer review report: Major Trauma 2015

4.4 Radiology

4.4.1 Summary of suggestions

Access and use

Stakeholders highlighted the importance of access to, and the use of, imaging. Stakeholders felt that immediate access to interventional radiology at all times and using it as first line treatment for bleeding are important. The availability and timing of CT and MRI scans was also raised, as well as ensuring that the appropriate body regions are scanned in a CT scan. Stakeholders stated that a full body scan does not always include the legs, and children are sometimes receiving a full body scan instead of selective scanning of the regions of interest.

Image reporting

Stakeholders highlighted that images should be interpreted and reported on immediately by appropriately trained staff, and that patients should not leave EDs without a clear diagnosis. This would reduce the numbers of missed fractures and poorer outcomes.

4.4.2 Selected recommendations from development sources

Table 11 below highlights recommendations that have been provisionally selected from the development sources that may support potential statement development. These are presented in full after table 11 to help inform the committee's discussion.

Table 11 Specific areas for quality improvement

Suggested quality improvement area	Selected source guidance recommendations
Access and use	**Haemorrhage imaging in hospital settings** NICE guideline NG39 Recommendations 1.5.28, 1.5.29, 1.5.30, 1.5.32 and 1.5.33 **Whole-body CT of multiple injuries** NICE guideline NG37 Recommendation 1.2.8-1.2.10, NICE guideline NG39 Recommendation 1.5.34-1.5.36 and NICE guideline NG41 Recommendation 1.5.12, 1.5.13 and 1.5.15 **Interventional radiology** NICE guideline NG39 Recommendations 1.5.40 and 1.5.43 **Interventional radiology and definitive open surgery – recommendation for hospital trust boards, medical directors and senior managers** NICE guideline NG40 Recommendation 1.11.3 **Suspected spinal cord or cervical column injury – Children** NICE guideline NG41 Recommendation 1.5.2
Image reporting	**Hot reporting** NICE guideline NG38 Recommendation 1.1.9 **Imaging to assess chest trauma** NICE guideline NG39 Recommendation 1.4.3 **Haemorrhage imaging in hospital settings** NICE guideline NG39 Recommendation 1.5.28 **Diagnostic imaging – Whole-body CT** NICE guideline NG41 Recommendation 1.5.1

Access and use

Haemorrhage imaging in hospital settings

NICE NG39 – Recommendation 1.5.28

Imaging for haemorrhage in patients with suspected haemorrhage should be performed urgently, and the images should be interpreted immediately by a healthcare professional with training and skills in this area.

NICE NG39 – Recommendation 1.5.29

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.

NICE NG39 – Recommendation 1.5.30

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

NICE NG39 – Recommendation 1.5.32

Do not use FAST or other diagnostic imaging before immediate CT in patients with major trauma.

NICE NG39 – Recommendation 1.5.33

Do not use FAST as a screening modality to determine the need for CT in patients with major trauma.

Whole-body CT of multiple injuries

NICE NG37 Recommendation 1.2.8, NICE NG39 Recommendation 1.5.34 and NICE NG41 Recommendation 1.5.12

Use whole-body CT (consisting of a vertex‑to‑toes scanogram followed by CT from vertex to mid‑thigh) in adults (16 or over) with blunt major trauma and suspected multiple injuries. Patients should not be repositioned during whole‑body CT.

NICE NG37 Recommendation 1.2.9, NICE NG39 Recommendation 1.5.35 and NICE NG41 Recommendation 1.5.13

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

NICE NG37 Recommendation 1.2.10, NICE NG39 Recommendation 1.5.36 and NICE NG41 Recommendation 1.5.15

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.

Interventional radiology

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

NICE NG39 – Recommendation 1.5.40

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

NICE NG39 – Recommendations 1.5.43

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

Interventional radiology and definitive open surgery – recommendation for hospital trust boards, medical directors and senior managers

NICE NG40 – Recommendation 1.11.3

Ensure that interventional radiology and definitive open surgery are equally and immediately available for haemorrhage control in all patients with active bleeding. (For more information see the section on interventional radiology in the NICE guideline 'Major trauma' and the section on controlling pelvic haemorrhage in the NICE guideline 'Fractures (complex)'.

Suspected spinal cord or cervical column injury – Children

NICE NG41 – Recommendation 1.5.2

Perform MRI for children (under 16s) if there is a strong suspicion of:

- cervical spinal cord injury as indicated by the Canadian C‑spine rule and by clinical assessment or
- cervical spinal column injury as indicated by clinical assessment or abnormal neurological signs or symptoms, or both.

Image reporting

Hot reporting

NICE NG38 – Recommendation 1.1.9

A radiologist, radiographer or other trained reporter should deliver the definitive written report of emergency department X‑rays of suspected fractures before the patient is discharged from the emergency department.

Imaging to assess chest trauma

NICE NG39 – Recommendation 1.4.3

Imaging for chest trauma in patients with suspected chest trauma should be performed urgently, and the images should be interpreted immediately by a healthcare professional with training and skills in this area.

Haemorrhage imaging in hospital settings

NICE NG39 – Recommendation 1.5.28

Imaging for haemorrhage in patients with suspected haemorrhage should be performed urgently, and the images should be interpreted immediately by a healthcare professional with training and skills in this area.

Diagnostic imaging – Whole-body CT

NICE NG41 – Recommendation 1.5.1

Imaging for spinal injury should be performed urgently, and the images should be interpreted immediately by a healthcare professional with training and skills in this area.

4.4.3 Current UK practice

Access and use

A retrospective observational study of TARN data from 2012 to 2014 looked at variations in practice in UK trauma hospitals in the use of whole-body computed tomography (WBCT) in major trauma[21]. TARN inclusion criteria meant that the study only provided data on the use of WBCT in more seriously injured patients. The following findings were reported:

- of the 115,664 study participants, 16.5% had WBCT. WBCT was performed 5 times more frequently in MTCs than in TUs/non-designated hospitals (NDHs) (31% vs 6.6%), even after adjusting for demographic variables, injury severity, physiological factors and injury mechanism. It is not clear whether this indicates an overuse of WBCT by MTCs or an underuse of WBCT at TUs.
- the amount of variability between individual hospitals that could not be accounted for by the factors shown to impact on WBCT use was 26% (95% CI 17% to 39%) for MTCs and 17% (95% CI 13% to 21%) for TUs/NDHs. Much of this was explained by risk factors included in multivariate analysis, but some correlations (for gender and injury mechanism) may reflect biases in the management of patients with trauma rather than decisions based on best practice.
- the percentage of patients with trauma having WBCT during working hours (29.6% at MTCs and 5.6% at TUs/NDHs) was less than the percentage having WBCT on evenings and weekends (32.1% at MTCs and 7.1% at TUs/NDHs).

[21] Sammy et al (2017) The use of whole-body computed tomography in major trauma: variations in practice in UK trauma hospitals Emergency Medicine Journal. Published Online First: 27 January 2017

The Major Trauma 2015 national peer review[22] reported compliance levels across trauma services against the following standards:

- 24/7 CT scanner facilities (located in the ED) and on-site radiographer:
    - 73% compliance for 22 MTCs assessed against the adult measures
    - 67% compliance for 15 MTCs (including 5 dedicated paediatric MTCs) assessed against the children's measures
- 24/7 CT scanner facilities: there should be CT scanning available within 30 minutes of the request 24/7 - 47% compliance for 105 TUs assessed
- network CT protocols: the TU should agree the network protocols for trauma CT for adults and children - 49% compliance for 105 TUs assessed
- network CT protocols for adults and imaging protocol for children: there should be a network agreed trauma CT/imaging protocol which is used in all TUs. The protocol for children should include imaging of:
    - head;
    - neck and spine;
    - abdomen;
    - pelvis.

  57% compliance for the adult measure and 70% compliance for the children's measure for the 22 Major Trauma Networks assessed.

- teleradiology facilities: the TU should have an image exchange portal that enables immediate image transfer to the MTC 24/7 - 94% compliance for 105 TUs assessed
- 24/7 MRI scanning facilities:
    - 87% compliance for 22 MTCs assessed against the adult measures
    - 93% compliance for 15 MTCs (including 5 dedicated paediatric MTCs) assessed against the children's measures
- 24/7 interventional radiology: interventional radiology should be available 24/7 within 60 minutes of a request.
    - 77% compliance for 22 MTCs assessed against the adult measures
    - 73% compliance for 15 MTCs (including 5 dedicated paediatric MTCs) assessed against the children's measures

[22] NHS England (2015) National peer review report: Major Trauma 2015

The peer review also identified the following issues for some services:

TUs:

- Trust with access to only 1 CT scanner, which had been unavailable more than once in the previous 5 months due to technical faults. Contingency access to CT scanning is at a distance of 30 miles
- potential out of hour's delay of 40 minutes before arrival of on-call radiographers to perform emergency CT scans for trauma patients.
- CT scanning not available within 30 minutes of request due to equipment availability, staffing resources, protocol and location of CT facilities.

Major Trauma Networks:

- teleradiology facilities between MTC and TU not compatible to allow immediate image transfer 24/7, potentially compromising patient care and outcomes.

Adult MTCs:

- interventional radiology was not available within 60 minutes of request 24/7.

Children's MTCs:

- interventional radiology service not available within 60 minutes of request 24/7.

Confidential data from the National Clinical Audit for Major Trauma also informed the discussion.

Image reporting

The Major Trauma 2015 national peer review[23] reported compliance levels across trauma services against the following standards:

- Adult and Children's MTC measure on CT reporting: there should be a protocol for trauma CT reporting that specifies:
    - there should be a 'hot' report available within 5 minutes;
    - there should be detailed radiological report available within 1 hour;
    - scans should be reported by a consultant radiologist within 24 hours (or consultant paediatric radiologist within 12 hours for children).

  Compliance for the 22 MTCs assessed against the adult measure was 64%, and for the 15 MTCs assessed against the children's measures was 53%.

- TU measure on CT reporting: there should be a protocol for trauma CT reporting that specifies there should be a provisional report available within 60 minutes - compliance was 42% for the 105 TUs assessed.

[23] NHS England (2015) National peer review report: Major Trauma 2015

The peer review also identified the following issues for some services:

- the provisional report of CT scans was not ready within 60 minutes and reporting of CT scans out of hours was not available within 60 minutes for some TUs
- inadequate seniority of reporting on 'hot' and 'detailed' CT reports for some MTCs assessed against the children's measures
- issues with CT reporting, including delays in availability of reports, seniority of reporting and transfer of images from TU to MTC for some MTCs assessed against the adult measures.

4.4.4 Resource impact assessment

Access and use

The additional use of CT or MRI for first-line imaging will put further demands on resources, which are currently limited. This may mean that organisations need to redesign their imaging services and review the capacity and availability of 7-day working in imaging departments. This should involve using existing resources differently and be linked to planned capital investment in imaging services. The resource impact will depend on whether it is a MTC, TU or ED.

Implementing the guideline recommendations should lead to improved diagnosis of fractures. This may reduce the use of NHS resources from return visits to an ED or visits to a GP who may refer the person to secondary care.

Potential savings could result from:

- reduced ED costs. This may save between £56 and £239 per attendance (Enhanced tariff option for 2015/16)
- reduced repeat hospital attendances. This may save between £76 and £130 for each avoided adult trauma and orthopaedics attendance, and £93–£144 for each paediatric trauma and orthopaedics attendance (Enhanced tariff option for 2015/16)
- reduced litigation costs.

Image reporting

There may be costs for hot reporting to cover out of hours. Clinical experts suggest that many centres already have good arrangements for reporting in hours because of radiology registrars and reporting radiographers.

Providing an immediate interpretation of ED X-ray tests could reduce recalls and also enable quick treatment. It would also reduce inappropriate referrals for follow-up care as a result of false-positive diagnosis. This may help to:

- reduce admissions to hospital

- reduce the number of missed fractures and the need for subsequent patient recall because of a change in the management plan after the patient has left the ED. This could save £76–£130 (adult outpatient settings) and £93–£144 (paediatric outpatient settings) (Enhanced tariff option for 2015/16)
- reduce ED consultant time reviewing the reports that come back with positive findings 24–48 hours after patient was discharged.

4.5 Pain management

4.5.1 Summary of suggestions

Stakeholders highlighted that pain should be assessed regularly and appropriate pain relief options used when needed, such as when RSI cannot be guaranteed.

4.5.2 Selected recommendations from development sources

Table 12 below highlights recommendations that have been provisionally selected from the development sources that may support potential statement development. These are presented in full after table 12 to help inform the committee's discussion.

Table 12 Specific areas for quality improvement

Suggested quality improvement area	Selected source guidance recommendations
Pain management	**Initial pain management and immobilisation** NICE NG38 Recommendations 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6 and 1.1.8 **Pain management in pre‑hospital and hospital settings** NICE NG39 Recommendations 1.7.2-1.7.4 **Pain management in pre‑hospital and hospital settings** NICE NG41 Recommendations 1.2.2-1.2.5

Initial pain management and immobilisation

Pain assessment

NICE NG38 – Recommendation 1.1.2

Assess pain regularly in people with fractures using a pain assessment scale suitable for the person's age, developmental stage and cognitive function.

NICE NG38 – Recommendation 1.1.3

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

Initial pharmacological management of pain in adults (16 or over)

NICE NG38 – Recommendation 1.1.4

For the initial management of pain in adults (16 or over) with suspected long bone fractures of the legs (tibia, fibula) or arms (humerus, radius, ulna), offer:

- oral paracetamol for mild pain

- oral paracetamol and codeine for moderate pain
- intravenous paracetamol supplemented with intravenous morphine titrated to effect for severe pain.

NICE NG38 – Recommendation 1.1.5

Use intravenous opioids with caution in frail or older adults.

NICE NG38 – Recommendation 1.1.6

Do not offer non‑steroidal anti‑inflammatory drugs (NSAIDs) to frail or older adults with fractures.

Initial pharmacological management of pain in children (under 16s)

NICE NG38 – Recommendation 1.1.8

For the initial management of pain in children (under 16s) with suspected long bone fractures of the legs (femur, tibia, fibula) or arms (humerus, radius, ulna), offer:

- oral ibuprofen, or oral paracetamol, or both for mild to moderate pain
- intranasal or intravenous opioids for moderate to severe pain (use intravenous opioids if intravenous access has been established).

Pain management in pre‑hospital and hospital settings

Pain assessment

NICE NG39 – Recommendation 1.7.2

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

NICE NG39 – Recommendation 1.7.3

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

Pain relief

NICE NG39 – Recommendation 1.7.4

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

Pain management in pre-hospital and hospital settings

Pain assessment

NICE NG41 – Recommendation 1.2.2

Assess pain regularly in people with spinal injury using a pain assessment scale suitable for the patient's age, developmental stage and cognitive function.

NICE NG41 – Recommendation 1.2.3

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

Pain relief

NICE NG41 – Recommendation 1.2.4

Offer medications to control pain in the acute phase after spinal injury.

NICE NG41 – Recommendation 1.2.5

For people with spinal injury use intravenous morphine as the first-line analgesic and adjust the dose as needed to achieve adequate pain relief.

4.5.3 Current UK practice

The Major Trauma 2015 national peer review[24] reported compliance levels across trauma services against the following standards:

- pain management protocol for adult patients: there should be a pre-hospital pain management protocol for adult major trauma patients. This should include details of pain management by:
    - Paramedic
    - Pre-hospital doctor.

  73% compliance for the 11 Ambulance Services assessed.

- pain management protocol for children (same as adult measure): 73% compliance for the 11 Ambulance Services assessed.
- 24/7 specialist acute pain service: there should be a 24/7 specialist acute pain service available for major trauma patients. The MTC should have pain management pathways for:
    - patients with severe chest injury and rib fractures;
    - early access to epidural pain management (within 6 hours).

[24] NHS England (2015) National peer review report: Major Trauma 2015

The MTC should audit the pain management of major trauma patients including patients with severe chest injuries (AIS3+), who were not ventilated and who received epidural analgesia.

- Compliance for the 22 MTCs assessed against the adult measure was 32%, and for the 15 MTCs assessed against the children's measures was 73%.

4.5.4 Resource impact assessment

There is no significant resource impact expected.

4.6 Spinal injury and fractures

4.6.1 Summary of suggestions

Spinal immobilisation

A stakeholder suggested that there should be improvements in the immobilisation of the spine for people with actual or suspected spinal injury to prevent further injury.

Pelvic fractures

Stakeholders highlighted that pelvic binders should be used for pelvic fracture where active bleeding is suspected, and feel that there is variation in practice.

Open fractures

A stakeholder suggested that giving intravenous antibiotics early, and preferably in a pre-hospital setting, could reduce the risk of infection in trauma cases. The importance of Trusts having suitable information governance policies to enable staff to take, use and store photographs of wounds was also raised.

4.6.2 Selected recommendations from development sources

Table 13 below highlights recommendations that have been provisionally selected from the development sources that may support potential statement development. These are presented in full after table 13 to help inform the committee's discussion.

Table 13 Specific areas for quality improvement

Suggested quality improvement area	Selected source guidance recommendations
Spinal immobilisation	**Assessment for spinal injury** NICE NG41 Recommendations 1.1.2 and 1.1.4 **When to carry out or maintain full in-line spinal immobilisation** NICE NG41 Recommendations 1.1.9 and 1.1.10 **How to carry out full in-line spinal immobilisation** NICE NG41 Recommendations 1.1.11-1.1.14 **Extrication** NICE NG41 Recommendation 1.1.15 **Emergency department assessment and management** NICE NG41 Recommendations 1.4.2 and 1.4.4 **When to carry out or maintain full in-line spinal immobilisation and request imaging** NICE NG41 Recommendations 1.4.7 and 1.4.8 **How to carry out full in-line spinal immobilisation** NICE NG41 Recommendation 1.4.9
Pelvic fractures	**Using a pelvic binder** NICE NG37 Recommendation 1.1.7 **Pelvic binders in pre-hospital settings** NICE NG39 Recommendation 1.5.3
Open fractures	**Initial management of open fractures before debridement** NICE NG37 Recommendation 1.1.10 **Management of open fractures before debridement** NICE NG37 Recommendation 1.2.22 **Photographic documentation of open fracture wounds** NICE NG37 Recommendations 1.3.4-1.3.6

Spinal immobilisation

Assessment for spinal injury

NICE NG41 – Recommendation 1.1.2

At all stages of the assessment:

- protect the person's cervical spine with manual in-line spinal immobilisation, particularly during any airway intervention **and**
- avoid moving the remainder of the spine.

NICE NG41 – Recommendation 1.1.4

Carry out full in-line spinal immobilisation if any of the factors in recommendation 1.1.3 are present or if this assessment cannot be done.

When to carry out or maintain full in‑line spinal immobilisation

NICE NG41 – Recommendation 1.1.9

Carry out or maintain full in‑line spinal immobilisation if:

- a high-risk factor for cervical spine injury is identified and indicated by the Canadian C‑spine rule
- a low-risk factor for cervical spine injury is identified and indicated by the Canadian C‑spine rule and the person is unable to actively rotate their neck 45 degrees left and right
- indicated by one or more of the factors listed in recommendation 1.1.7.

NICE NG41 – Recommendation 1.1.10

Do not carry out or maintain full in‑line spinal immobilisation in people if:

- they have low‑risk factors for cervical spine injury as identified and indicated by the Canadian C‑spine rule, are pain free and are able to actively rotate their neck 45 degrees left and right
- they do not have any of the factors listed in recommendation 1.1.7.

How to carry out full in‑line spinal immobilisation

NICE NG41 – Recommendation 1.1.11

When immobilising the spine tailor the approach to the person's specific circumstances (see recommendations 1.1.12 and 1.1.16 to 1.1.18).

NICE NG41 – Recommendation 1.1.12

The use of spinal immobilisation devices may be difficult (for example in people with short or wide necks, or people with a pre‑existing deformity) and could be counterproductive (for example increasing pain, worsening neurological signs and symptoms). In uncooperative, agitated or distressed people, including children, think about letting them find a position where they are comfortable with manual in‑line spinal immobilisation.

NICE NG41 – Recommendation 1.1.13

When carrying out full in‑line spinal immobilisation in adults, manually stabilise the head with the spine in‑line using the following stepwise approach:

- fit an appropriately sized semi‑rigid collar unless contraindicated by:
  - a compromised airway
  - known spinal deformities, such as ankylosing spondylitis (in these cases keep the spine in the person's current position).
- reassess the airway after applying the collar.
- place and secure the person on a scoop stretcher.
- secure the person with head blocks and tape, ideally in a vacuum mattress.

NICE NG41 – Recommendation 1.1.14

When carrying out full in‑line spinal immobilisation in children, manually stabilise the head with the spine in‑line using the stepwise approach in recommendation 1.1.13 and consider:

- involving family members and carers if appropriate
- keeping infants in their car seat if possible
- using a scoop stretcher with blanket rolls, vacuum mattress, vacuum limb splints or Kendrick extrication device.

Extrication

NICE NG41 – Recommendation 1.1.15

When there is immediate threat to a person's life and rapid extrication is needed, make all efforts to limit spinal movement without delaying treatment.

Emergency department assessment and management

NICE NG41 – Recommendation 1.4.2

Protect the person's cervical spine as in recommendation 1.1.2 or maintain full in‑line spinal immobilisation.

NICE NG41 – Recommendation 1.4.4

Carry out or maintain full in-line spinal immobilisation in the emergency department if any of the factors in recommendation 1.1.3 are present or if this assessment cannot be done.

When to carry out or maintain full in-line spinal immobilisation and request imaging

NICE NG41 – Recommendation 1.4.7

Carry out or maintain full in-line spinal immobilisation and request imaging if:

- a high-risk factor for cervical spine injury is identified and indicated by the Canadian C-spine rule or
- a low-risk factor for cervical spine injury is identified and indicated by the Canadian C-spine rule and the person is unable to actively rotate their neck 45 degrees left and right or
- indicated by one or more of the factors listed in recommendation 1.1.7.

NICE NG41 – Recommendation 1.4.8

Do not carry out or maintain full in-line spinal immobilisation or request imaging for people if:

- they have low-risk factors for cervical spine injury as identified and indicated by the Canadian C-spine rule, are pain free and are able to actively rotate their neck 45 degrees left and right
- they do not have any of the factors listed in recommendation 1.1.7.

How to carry out full in-line spinal immobilisation

NICE NG41 – Recommendation 1.4.9

When carrying out or maintaining full in-line immobilisation refer to recommendations 1.1.11 to 1.1.14.

Pelvic fractures

Using a pelvic binder

NICE NG37 – Recommendation 1.1.7

If active bleeding is suspected from a pelvic fracture following blunt high-energy trauma:

- apply a purpose-made pelvic binder, or

- consider an improvised pelvic binder but only if a purpose‑made binder does not fit.

Pelvic binders in pre-hospital settings

NICE NG39 – Recommendation 1.5.3

If active bleeding is suspected from a pelvic fracture after blunt high‑energy trauma:

- apply a purpose‑made pelvic binder or
- consider an improvised pelvic binder, but only if a purpose‑made binder does not fit.

Open fractures

Initial management of open fractures before debridement

NICE NG37 – Recommendation 1.1.10

In the pre‑hospital setting, administer prophylactic intravenous antibiotics as soon as possible and preferably within 1 hour of injury to people with open fractures without delaying transport to hospital.

Management of open fractures before debridement

NICE NG37 – Recommendation 1.2.22

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

Photographic documentation of open fracture wounds

NICE NG37 – Recommendations 1.3.4

All trusts receiving patients with open fractures 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.

NICE NG37 – Recommendations 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.

NICE NG37 – Recommendations 1.3.6

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

4.6.3 Current UK practice

Spinal immobilisation

A study[25] of the causes of neurological deterioration in 59 patients with spinal cord injury on whom reports were prepared for clinical negligence litigation found that:

- neurological deterioration occurred in 23 of 38 patients (61%) with unstable fractures and/or dislocations
- all 23 patients probably deteriorated either because of failures to immobilise the spine or because of inappropriate removal of spinal immobilisation
- of the 27 patients (46%) who altered neurologically, neurological deterioration was, probably, avoidable in 25 (excess movement in 23 patients with unstable injuries, failure to evacuate an epidural haematoma in 1 patient and over-distraction following manipulation of the cervical spine in 1 patient).

Pelvic fractures

The Major Trauma 2015 national peer review[26] reported compliance levels across trauma services against the following standard:

- application of pelvic binders: there should be a protocol for the application of Pelvic binders as pre-hospital care by trained paramedics - 88% compliance for 11 Ambulance Services assessed.

Open fractures

A study that assessed concordance with national British Orthopaedic Association/British Association of Plastic Reconstructive and Aesthetic Surgeons guidelines on management of open lower limb fractures, reviewed the care of 42 patients admitted to the Royal Stoke University hospital with open lower limb fractures from January 2013 to July 2014[27]. The study found no cases where antibiotic guidelines[28] were correctly applied.

4.6.4 Resource impact assessment

There is no significant resource impact expected.

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[25] Todd, Skinner and Wilson-Macdonald (2015) Secondary neurological deterioration in traumatic spinal injury data from medicolegal cases The Bone and Joint Journal (2015) 97-B:527-31
[26] NHS England (2015) National peer review report: Major Trauma 2015
[27] Rymer et al (2015) Management of open lower limb fractures at RSUH: An audit of compliance with national BOA/BAPRAS guidelines International Journal of Surgery 23 S15-S134
[28] British Association of Plastic Reconstructive and Aesthetic Surgeons Standards for the management of open fractures of the lower limb includes recommendations that antibiotics should be administered as soon as possible after the injury and certainly within 3 hours.

4.7 Information and support for patients, family members and carers

4.7.1 Summary of suggestions

Stakeholders highlighted the need to provide clear and consistent information to families of trauma patients, including information on treatment, transfers and outcomes, to improve wellbeing. Stakeholders felt that this is not always being done well, particularly in pre-hospital settings. Having a single point of contact and dedicated staff to provide information and support unaccompanied children and vulnerable adults was also raised.

4.7.2 Selected recommendations from development sources

Table 14 below highlights recommendations that have been provisionally selected from the development sources that may support potential statement development. These are presented in full after table 14 to help inform the committee's discussion.

Table 14 Specific areas for quality improvement

Suggested quality improvement area	Selected source guidance recommendations
Information and support for patients, family members and carers	**Information and support for patients, family members and carers** NICE NG37 Recommendations 1.4.1-1.4.15 NICE NG38 Recommendations 1.6.1-1.6.13 NICE NG39 Recommendations 1.9.1-1.9.13 NICE NG40 Recommendations 1.9.1-1.9.5 NICE NG41 Recommendations 1.8.1-1.8.14

Information and support for patients, family members and carers

Recommendation for ambulance and hospital trust boards, senior managers and commissioners

NICE NG40 – Recommendation 1.9.1

Establish a protocol for providing information and support to patients, family members and carers.

Providing support

NICE NG37 Recommendation 1.4.1, NICE NG38 Recommendation 1.6.1, NICE NG39 Recommendation 1.9.1 and NICE NG 41 Recommendation 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.

NICE NG37 Recommendation 1.4.2, NICE NG39 Recommendation 1.9.2, NICE NG40 Recommendation 1.9.2 and NICE NG 41 Recommendation 1.8.2

The trauma team structure should include a clear point of contact for providing information to patients, their family members and carers.

NICE NG41 – Recommendation 1.8.3

Make eye contact and be in the patient's eye line to ensure that you are visible when communicating with this person to avoid them moving their head.

NICE NG37 Recommendation 1.4.3, NICE NG38 Recommendation 1.6.2, NICE NG39 Recommendation 1.9.3 and NICE NG 41 Recommendation 1.8.4

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

NICE NG37 Recommendation 1.4.4 and NICE NG38 Recommendation 1.6.3

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

NICE NG39 Recommendation 1.9.4 and NICE NG41 Recommendation 1.8.5

If the patient agrees, invite their family member, carer or friend into the resuscitation room. Ensure that they are accompanied by a member of staff and their presence does not affect assessment, diagnosis or treatment.

Support for children and vulnerable adults

NICE NG37 Recommendation 1.4.5, NICE NG38 Recommendation 1.6.4, NICE NG39 Recommendation 1.9.5, NICE NG40 Recommendation 1.9.4 and NICE NG 41 Recommendation 1.8.6

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

NICE NG37 Recommendation 1.4.6, NICE NG39 Recommendation 1.9.6 and NICE NG 41 Recommendation 1.8.7

Contact the mental health team as soon as possible for patients 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.

NICE NG37 Recommendation 1.4.7, NICE NG38 Recommendation 1.6.5, NICE NG39 Recommendation 1.9.7 and NICE NG41 Recommendation 1.8.8

For a child or vulnerable adult with a complex fracture/fracture/major trauma/spinal injury, enable their family members or carers to remain within eyesight if appropriate.

NICE NG37 Recommendation 1.4.8, NICE NG38 Recommendation 1.6.6, NICE NG39 Recommendation 1.9.8 and NICE NG41 Recommendation 1.8.9

Work with family members and 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.

NICE NG37 Recommendation 1.4.9, NICE NG38 Recommendation 1.6.7, NICE NG39 Recommendation 1.9.9 and NICE NG41 Recommendation 1.8.10

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

Providing information

NICE NG37 Recommendation 1.4.10, NICE NG38 Recommendation 1.6.8, NICE NG39 Recommendation 1.9.10 and NICE NG41 Recommendation 1.8.11

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. (NICE NG39 and NICE NG41 only)

NICE NG37 Recommendation 1.4.11 and NICE NG38 Recommendation 1.6.9

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

NICE NG37 Recommendation 1.4.12 and NICE NG38 Recommendation 1.6.10

Provide people with fractures with both verbal and written information on the following when the management plan is agreed or changed:

- 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 (NICE NG37 only)
- 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.

NICE NG39 Recommendation 1.9.11 and NICE NG41 Recommendation 1.8.12

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

NICE NG37 Recommendation 1.4.13, NICE NG38 Recommendation 1.6.11, NICE NG39 Recommendation 1.9.12, NICE NG40 Recommendation 1.9.3 and NICE NG41 Recommendation 1.8.13

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

NICE NG37 Recommendation 1.4.14 and NICE NG38 Recommendation 1.6.12

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.

Providing information about transfer from an emergency department

NICE NG37 Recommendation 1.4.15, NICE NG38 Recommendation 1.6.13, NICE NG39 Recommendation 1.9.13, NICE NG40 Recommendation 1.9.5 and NICE NG41 Recommendation 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
- the location of the receiving centre and the patient's destination within the receiving centre

- provide information on the linked spinal cord injury centre (in the case of cord injury) or the unit the patient will be transferred to (in the case of column injury or other injuries needing more immediate attention) – NICE NG41 only
- the name and contact details of the person responsible for the patient's care at the receiving centre
- the name and contact details of the person who was responsible for the patient's care at the initial hospital.

4.7.3 Current UK practice

No published studies on current practice were highlighted for this suggested area for quality improvement; this area is based on stakeholder's knowledge and experience.

4.7.4 Resource impact assessment

There is no significant resource impact expected.

4.8 Additional areas

Summary of suggestions

The improvement areas below were suggested as part of the stakeholder engagement exercise. However they were felt to be either unsuitable for development as quality statements, outside the remit of this particular quality standard referral or require further discussion by the committee to establish potential for statement development.

There will be an opportunity for the committee to discuss these areas at the end of the session on 7th September.

Data submission to the Trauma Audit and Research Network (TARN)

Stakeholders felt that TUs need to submit good quality and accurate data to TARN to enable assessment of the quality of trauma care nationally, but submission rates are low from some units. Participation within audits are not considered quality improvement areas and are therefore outside of the scope of quality standards. An audit may be referred to in how a quality improvement is measured.

Distal femoral fractures and hip fractures

A stakeholder suggested that distal femoral fractures should be treated the same as hip fractures, with patients having surgery within 36 hours and having orthogeriatric involvement. There was also a suggestion that time from diagnosis to surgery should be measured for people with fractured neck of femur, instead of time from admission. There are no recommendations that support the suggestions on distal femoral fractures within the development sources (NICE NG37, NG38, NG39, NG40 and NG41) and the recommendations in the NICE hip fracture guideline (CG124) do not cover distal femoral fractures. The NICE hip fracture guideline (CG124) has recommendations on timing of surgery, but this recommends timings from when a person is admitted.

Orthogeriatric review for elderly patients

A stakeholder suggested that elderly patients should have an orthogeriatric review within 48 hours of admission. There are no recommendations on this area within the development sources (NICE NG37, NG38, NG39, NG40 and NG41).

Evidence on pre-hospital medical care

Stakeholders commented on the evidence relating to pre-hospital care, including paramedics with enhanced competencies and the cost-effectiveness of pre-hospital medical care. NICE quality standards do not review nor re-appraise the underlying primary evidence base.

Injury prevention programmes

A stakeholder suggested the quality and effectiveness of injury prevention programmes as a quality improvement area. There are no recommendations on this area within the development sources (NICE NG37, NG38, NG39, NG40 and NG41) and the quality standard is not focusing on injury prevention.

Radiographer-led discharge

A stakeholder suggested that radiographers extend their roles and contribute to the management of patients by leading on discharge. There are no recommendations on this area within the development sources (NICE NG37, NG38, NG39, NG40 and NG41).

Staff training

Stakeholders suggested that access to training needs to improve to ensure that there are enough skilled staff available in trauma teams and networks. There was also a suggestion that all surgical trainees should gain experience of MTCs. Quality statements on staff training are not usually included in quality standards as healthcare professionals involved in assessing, caring for and treating people with trauma should have sufficient and appropriate training and competencies. Training may enable quality improvement to take place but is not considered as a quality improvement area.

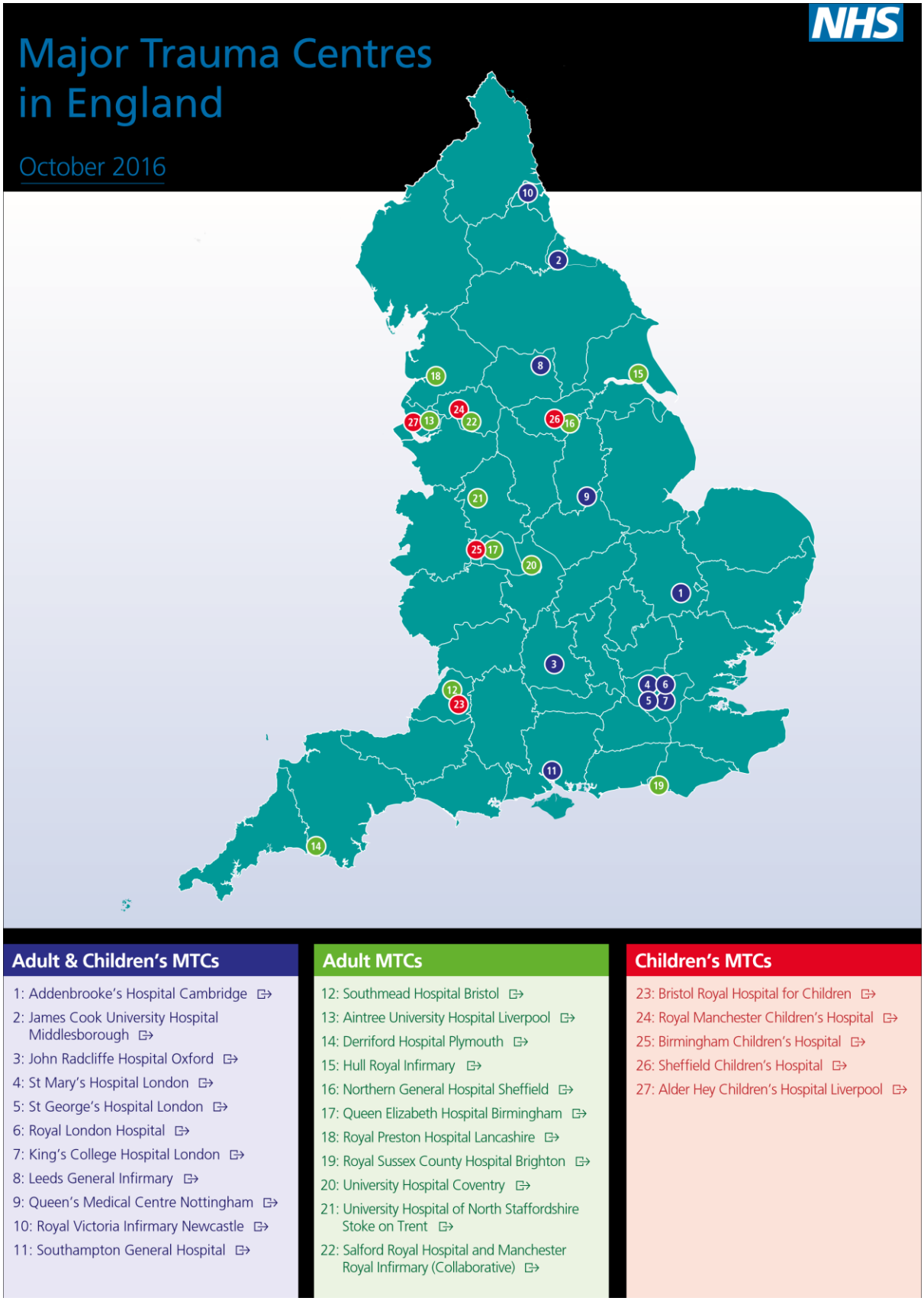
Helicopter emergency medical systems

A stakeholder suggested that there should be an increased availability of helicopter emergency medical systems for trauma patients. There are no recommendations on this area within the development sources (NICE NG37, NG38, NG39, NG40 and NG41).

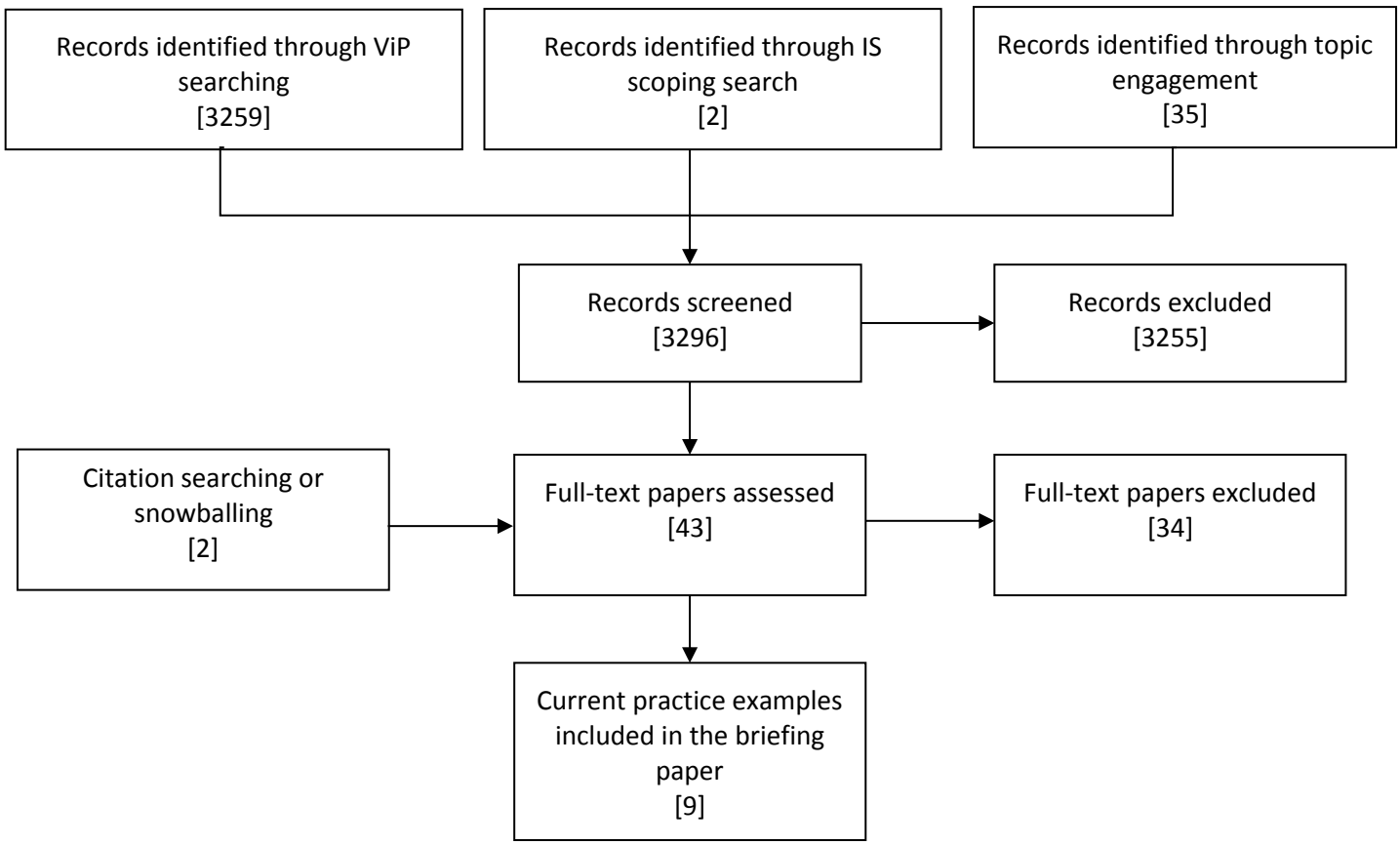
Sepsis

A stakeholder suggested that protocols for haemodynamic optimisation and identification of sepsis should be developed and implemented in the emergency department. Risk stratification and giving intravenous fluids to people with suspected sepsis are covered in the quality standard on sepsis, which is due to publish in September 2017.

Appendix 1: Map of Major Trauma Centres in England



Appendix 2: Review flowchart



Appendix 3: Suggestions from stakeholder engagement exercise – registered stakeholders

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
General comments					
1	Royal College of Anaesthetists	ADDITIONAL COMMENTS FROM RCOA	We note that the primary sources used are mainly existing NICE guidelines. We would recommend that standards from non UK major trauma networks are also reviewed.		
4.1 Organisation of services					
Pre-hospital triage					
2	Faculty of Intensive Care Medicine/Intensive Care Society	Recognition of major trauma in the elderly	Many elderly patients are recognised as having sustained major trauma later in their hospital journey compared to younger patients. There are delays in recognition both pre-hospital and in-hospital. These often result in inappropriate initial management, delays in recognition of the severity of injury, delays in treatment, poorer outcomes and higher health and social costs.	Protocols for improved recognition of potential major trauma in the elderly are required. These may include a lower sensitivity for CT scan in elderly patients (Older patients with traumatic brain injury present with a higher GCS score than younger patients for a given severity of injury.	Kehoe A, Smith JE, Bouamra O, et al. EMJ 2016; 33:381–385.
3	Faculty of Intensive Care Medicine/Inte	Management of major trauma in the elderly	Roughly 50% of major trauma occurs in the >65s as the result of a fall from <2m. Many of these patients are managed in the hospital of first admission.	If there are differences it would help to see for which groups of patients and what factors affect outcome. This includes early decisions regarding appropriateness of care including referral to ICU.	Coats TJ, Lecky F. 'Major trauma': now two separate diseases. EMJ 2017; epub ahead of print

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
	nsive Care Society		Comparison of management in major trauma centres vs trauma units would help to determine whether such patients are best managed locally or transferred to a MTC.		
4	Royal College of Nursing	1 Pre hospital Trauma care	Good pre hospital trauma care increases the chances of survival of trauma victims. This includes good triage at the site of the injury	Need to be sure protocol is followed in a timely manner. Where the patient is injured takes place is a good predictor of outcome	Newgard et al (2017)
5	Royal College of Nursing	4 Initial treatment	Varies from ED to ED. Efficient and effective ABCDE		
6	The Royal College of Surgeons of Edinburgh	1 - Triage	To make sure that there is early and reliable categorisation on the type of injuries so that patients can be directed to the appropriate level of care.	The reality is that for many people trauma is stressful due to the wide ranging demands on the consultant, poor resources (beds/rehab/ training/cpd) Cases which should be grouped to develop expertise are often widely spread among different facilities diluting experience and the relative infrequency of on call and lack of facilities out hours means that it is easy to become deskilled. Ultimately, we need a national plan.	
7	SCM 1	Trauma Triage Tool	The Major Trauma Service Delivery guideline recommends:	At present different trauma networks have different trauma triage tools in place which	There is a national structure of ambulance

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
			Provide a pre-hospital major trauma triage tool to differentiate between patients who should be taken to a major trauma centre and those who should be taken to a trauma unit for definitive management. A single national ambulance triage tool should be developed to ensure robust decisions across the UK.	may lead to differing decisions across the UK regarding the destination for trauma patients.	service management groups under the auspices of Assn of Ambulance Chief Executives who could undertake this work.
8	SCM 2	1. Early accurate triage of all major trauma patients.	Late triage means late care.	TARN evidence shows that early consultant involvement is poor when there is no ambulance pre-warning.	TARN
Transfer					
9	Royal College of Emergency Medicine	1 Time critical transfers from TU to MTC	As highlighted in NICE Major Trauma Service Delivery Recommendation 22: Ensure that patients with major trauma who need critical interventions at an MTC leave the sending emergency department within 30 minutes of the decision to transfer.	As per the NICE review there is no evidence to support or refute the importance of timely transfer for critical interventions though the benefits would appear self-evident. Data on time critical transfers is not routinely reported on by TARN but expert opinion identifies this as an area of concern.	The TARN database should be able to provide information on current performance against this standard with minimal modification.

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
				This measure would provide an excellent surrogate marker for the efficiency of trauma networks.	
10	The Royal College of Surgeons of Edinburgh	2 - Clear, non-politicised, identification of which centre provides what level of care.	Systems need to be in place for appropriate transfer and communication. Better organisation is often more important than increased funding.	The reality is that for many people trauma is stressful due to the wide ranging demands on the consultant, poor resources (beds/rehab/ training/cpd) Cases which should be grouped to develop expertise are often widely spread among different facilities diluting experience and the relative infrequency of on call and lack of facilities out hours means that it is easy to become deskilled. Ultimately, we need a national plan.	
11	SCM 1	Transfers from Trauma Units to Trauma Centres	The process for arranging and undertaking transfers from TU to MTC is often delayed.	Slick processes around decision making and resourcing for these transfers is essential in order for the patient to get the maximum benefit from the transfer.	
12	SCM 2	3. Consider a standard for the timing of inter-hospital transfer of trauma patients.	As per the next box.	Although transfer time depends (in part) on the distances involved, the whole process (preparation/ordering ambulance/transfer into and out of ambulance/reception by receiving hospital etc) can be time consuming and can/may have a deleterious effect on patient outcome.	Personal experience.

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
13	SCM 3	Time critical transfers in from Trauma Units to Major Trauma Centres	Patients need to be at a definitive care hospital such as a Major Trauma Centre for the timely management of many life threatening injuries and this is dependent upon recognition of the time pressures and rapid onward transfers	Expert opinion suggests that patients are still spending too long at trauma units before being transferred and this would present a key area for a drive in improving overall patient care quality by streamlining the process with a time target.	Severe Injury in Children 2013-14 (Trauma Audit and Research Network)
Organisation and access to services					
14	Faculty of Intensive Care Medicine/Intensive Care Society	Delays in access to rehabilitation and inappropriate repatriation	The recommendation is that patients with major trauma receive acute rehabilitation at the major trauma centre. Many patients from outside the immediate locality of the MTC are being repatriated to their local hospital pending availability of a rehabilitation bed. For patients from the immediate locality of the MTC, many who are suitable for rehabilitation continue to wait on acute wards until a rehabilitation bed is available. This has direct effects on the outcome for patients and indirect effects on other patients as inappropriate occupation of acute beds delays discharge from ICU, delays admission from emergency		

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
			departments and delays elective admissions.		
15	NHS England	Rehabilitation			
16	NHS England	The development of defined training pathways to ensure that major trauma networks have the manpower to maintain the highest standards of care.	At present there remain issues within networks where there are gaps in rotas and not enough appropriately skilled doctors to provide urgent lifesaving surgery to major trauma victims.	There are opportunities which become time dependant for lives to be saved with timely emergency surgical intervention The RCS has published reports highlighting these workforce issues Through HEE 5 major trauma transitional fellowships are being developed, but these will not be enough. Training to support trauma networks requires incentivisation, organisation and a long term plan to ensure trauma victims are met at the scene and the front door of units by a complete trauma team	N Tai and M Bircher, Trauma Systems in England-a strategy for Major Trauma Workforce Generation and Sustainability, March 2014, Royal College of Surgeons of England Briefing Note 2015: Major Trauma Workforce Sustainability RCS England website
17	Royal College of Nursing	3 Assessment	Need an effective trauma team this improves survival rates.	Variations in ED departments around the role of the trauma team. Vertical/horizontal organisation	Driscoll P, Vincent C (1992) Organising an efficient trauma team. Injury. 23, 2, 107-110.

18	The Royal College of Surgeons of Edinburgh	3 - Standards	Ensure that minimum standards are set for each centre of care which are enforced. These should include appropriate levels of A+E staffing/ adequate bed availability / appropriate rota cover and appropriate level of training of those providing cover/ Minimum facilities in and out of hours / appropriate aftercare (physio etc.).	The reality is that for many people trauma is stressful due to the wide ranging demands on the consultant, poor resources (beds/rehab/ training/cpd) Cases which should be grouped to develop expertise are often widely spread among different facilities diluting experience and the relative infrequency of on call and lack of facilities out hours means that it is easy to become deskilled. Ultimately, we need a national plan.	
19	The Royal College of Surgeons of Edinburgh	5 - Multidisciplinary working	Team (multidisciplinary) clear chains of command and responsibility. Clearer lines of delineation nationally over which speciality is responsible for which problem. Head injuries to be managed by appropriately trained specialists.	The reality is that for many people trauma is stressful due to the wide ranging demands on the consultant, poor resources (beds/rehab/ training/cpd) Cases which should be grouped to develop expertise are often widely spread among different facilities diluting experience and the relative infrequency of on call and lack of facilities out hours means that it is easy to become deskilled. Ultimately, we need a national plan.	
4.2 Airway management					
20	College of Paramedics	Airway management in trauma (especially recommendations around pharmacologically assisted airway management)			
21	College of Paramedics	Chest trauma			

22	Emergency Medical Retrieval and Transfer Service (EMRTS)	The 45 mins from time of call to RSI recommendation. We feel this is unrealistic in anywhere that is not largely urban and in areas such as Wales is the exception rather than the standard given our transit times to scene.			
23	Royal College of Anaesthetists	1 Decision making in prehospital anaesthesia/Rapid Sequence Induction (RSI)	It is a critical intervention being carried out by non-anaesthetists on very unwell patients.	Needs national engagement to look at standards of training, who is delivering anaesthesia, who is receiving anaesthesia and outcome.	
24	Royal College of Anaesthetists	2 Decision making in Emergency Department Anaesthesia/RSI	Often being done by junior anaesthetists using drugs not suited to the task.	Needs national engagement to look at standards of training, who is delivering anaesthesia, who is receiving anaesthesia and outcome.	
25	Royal College of Emergency Medicine	2 Rapid sequence intubation within 45 minutes of initial 999 call	See NICE Major Trauma: assessment and initial management Recommendation 1.2.3 Good quality early airway management prevents death and limits secondary brain injury.	'NCEPOD Trauma: Who Cares?' identified airway management as an area of significant concern. The latest TARN 'dashboard' suggests that less than 70% of patients with a low GCS are being intubated within 30 minutes *of arrival at an ED*. The conclusion must be that few patients have their airway secured in line with the NICE guidance. This measure would provide an excellent surrogate marker for the efficiency of pre-hospital major trauma care.	The TARN database should be easily able to provide this data.

26	Royal College of General Practitioners	Airway management (current practice)	Where early application of gold standard Rapid Sequence Intubation cannot be guaranteed, provision should be made for reliable early dispatch of practitioners to the scene of trauma who can secure a threatened airway using naso-pharyngeal airways, Pharmacologically assisted supraglotic airways or surgical cricothyroidotomy as appropriate.		
27	SCM 1	Airway Management	The Major Trauma Service Delivery guideline recommends the availability of a definitive airway (Rapid Sequence Induction) within 45 minutes of the initial call to the emergency services.	Methods of delivering this care vary across the UK. In some areas it is not available.	
28	SCM 3	Rapid sequence induction of anaesthesia with provision of a definitive airway within 45 minutes of initial 999 call in patients requiring it	Definitive airway management similarly improves outcomes in multiply injured patients, in bleeding patients and particularly in patients with major trauma who have also suffered severe head injuries. The earlier this can be achieved the better.	Delays can occur with decisions being made about whether to transport patients to a major trauma centre, trauma unit or to provide advanced airway care at the scene. This could drive care forward to either being delivered rapidly at scene or to move	TARN

4.3 Management of haemorrhage					
Fluid replacement					
29	Deltex Medical	Avoidance of Acute Kidney Injury (AKI)	It is estimated that one in five patients admitted to hospital will have AKI. http://www.karger.com/Article/FullText/337487 20-30% of AKI cases are deemed preventable. https://www.ncbi.nlm.nih.gov/pubmed/25340231	AKI is usually a consequence of reduced renal blood flow (in addition to other comorbidities). Hypovolaemia and hypotension can both contribute to its occurrence. Prevention or early treatment of hypovolaemia and hypotension will reduce the incidence and severity of AKI. Guideline 3.2 from the UK Renal Association Clinical Practice Guidelines on AKI. "We recommend that prescription of appropriate intra-venous fluid should be carefully considered following assessment of the patient's volume status. Thereafter the patient's clinical response should be monitored closely." https://www.karger.com/Article/Pdf/328075	Early haemodynamic assessment with an accurate and precise technology is crucial. Oesophageal Doppler monitoring (ODM+) has already been proven effective intraoperatively (NICE MTG3), and with additional monitoring capabilities via an arterial pressure line (using the most reliable mathematical algorithm for deriving flow from pressure*) and non-invasive high-definition impedance cardiography (HD-ICG), the ODM+ is a valuable tool for comprehensive monitoring and management from emergency admission, across the perioperative period, and in the intensive care setting
30	Deltex Medical	Safe management of intravascular fluids, intropes and vasoactive drugs from triage to ICU discharge	Management of fluids and drugs are crucial in the prevention of the aforementioned conditions, and essential in routine patient care.		Early haemodynamic assessment with an accurate and precise technology is crucial. Oesophageal Doppler monitoring (ODM+) has

					already been proven effective intraoperatively (NICE MTG3), and with additional monitoring capabilities via an arterial pressure line (using the most reliable mathematical algorithm for deriving flow from pressure*) and non-invasive high-definition impedance cardiography (HD-ICG), the ODM+ is a valuable tool for comprehensive monitoring and management from emergency admission, across the perioperative period, and in the intensive care setting
31	NHS Blood and Transplant and National Blood Transfusion Committee	2 In major haemorrhage use a ratio of one unit of red cells to one unit of plasma throughout the active bleeding period	This is in the NICE trauma guidance There is increasing evidence that early plasma given in a ratio with red cells at 1:1 improves outcomes in patients presenting with major haemorrhage due to trauma (PROPPR study)	National and regional audits have shown variation in practice esp. if plasma is not pre thawed and therefore there is a delay in provision of plasma http://onlinelibrary.wiley.com/doi/10.1002/bjs.10052/epdf	Recommended by BCSH guideline on the management of major haemorrhage 2015 and in a newly developed audit tool to support this guideline http://onlinelibrary.wiley.com/doi/10.1111/bjh.13580/full

			https://www.ncbi.nlm.nih.gov/pubmed/25647203	.	
32	Royal College of Anaesthetists	3 Blood transfusion in trauma	Need to understand and monitor national decisions around transfusion and time to achieve transfusion in severe trauma.	Concern is that even in Major Trauma Centres there are delays in receiving blood products and components.	
33	Royal College of Emergency Medicine	3 Blood Transfusion - avoidance of crystalloid in resuscitation and use of appropriate transfusion ratios	Increasing evidence supports the use of blood products in a ratio of one unit of packed red blood cells to one unit of FFP and the avoidance of crystalloid or colloid.	Expert opinion suggests that excessive colloids are still frequently used and that compliance with recommended transfusion ratios is variable. This measure would provide an excellent surrogate marker for the efficiency of initial resuscitation by the trauma team.	The TARN database should be able to provide information on current performance against this standard with minimal modification.
34	Royal College of Nursing	5 Active Resuscitation	Fluid management needs to be efficient and effective		Rizoli S (2003) Crystalloids and colloids in trauma resuscitation: a brief overview of the current debate. *Journal of Trauma, Injury, Infection and Critical Care.* 54, 5, Suppl,S82-88.
Haemostatic agents					
35	NHS Blood and Transplant and National Blood Transfusion Committee	1 Tranexamic acid should be given at the earliest opportunity and no later than 3 hours in patients with major trauma and active or	In the trauma standard Early TXA is associated with improved outcomes in patients with or at risk of major haemorrhage due to trauma as per Crash 2 trial	Although paramedics have been trained to administer TXA early, TARN data has shown variation in practice across the country	Collected as part of TARN dataset Recommended by BCSH guideline on the management of major haemorrhage 2015 and in a newly developed

		suspected active bleeding.	http://www.thelancet.com/crash-2		audit tool to support this guideline http://onlinelibrary.wiley.com/doi/10.1111/bjh.13580/full
36	SCM 3	Use of Tranexamic Acid, as part of a major haemorrhage protocol, administered within 3 hours for all actively bleeding trauma patients	Haemorrhage is a major source of trauma related deaths. It is relatively simple to manage initially by administering antifibrinolytic drugs, giving blood and blood products and looking for sources of bleeding that can be reversed.	Differences exist in the uptake and use of TXA and in the rapidity with which it is administered. Some regions are giving it pre-hospitally for example.	TARN
Haemorrhage protocols					
37	NHS Blood and Transplant and National Blood Transfusion Committee	3 Trauma centres should have major haemorrhage protocols in place for paediatric and adults - these should be audited regularly to ensure that they are working properly	This is in NICE trauma guidance and has been recommended following an NPSA Rapid response report in 2010 http://www.nrls.npsa.nhs.uk/EasySiteWeb/getresource.axd?AssetID=83689 http://www.nrls.npsa.nhs.uk/alerts/?entryid45=83659	National and regional audits have shown variation in practice http://onlinelibrary.wiley.com/doi/10.1002/bjs.10052/epdf	Recommended by BCSH guideline on the management of major haemorrhage 2015 / BSCH guideline on transfusion in neonates and children 2017 and in newly developed audit tools to support these guidelines http://onlinelibrary.wiley.com/doi/10.1111/bjh.13580/full http://onlinelibrary.wiley.com/doi/10.1111/bjh.14233/full

38	SCM 3	Use of Tranexamic Acid, as part of a major haemorrhage protocol, administered within 3 hours for all actively bleeding trauma patients	Haemorrhage is a major source of trauma related deaths. It is relatively simple to manage initially by administering antifibrinolytic drugs, giving blood and blood products and looking for sources of bleeding that can be reversed.	Differences exist in the uptake and use of TXA and in the rapidity with which it is administered. Some regions are giving it pre-hospitally for example.	TARN
4.4 Radiology					
Access and use					
39	British Society of Interventional Radiology (BSIR)	Access to interventional radiology	24 IR availability save lives need to ensure more availability	Despite evidence it is clear that IR is still not being used as first line. Patients are still going to theatre often in the wrong sequence. There needs to be clear clinical instruction for the order of a patient's treatment. This is true for all points below	POIR RCR document [PD Think it refers to this https://www.rcr.ac.uk/publication/provision-interventional-radiology-services]
40	British Society of Interventional Radiology (BSIR)	Embolisation in acute bleeding	Is IR under utilise in trauma		
41	British Society of Interventional Radiology (BSIR)	CT assessment for trauma	What is the algorithm for CT demonstrating bleeding to IR treatment		

42	British Society of Interventional Radiology (BSIR)	Time of major trauma to intervention for bleeding	The importance is speed, what factor delay IR stopping bleeding		
43	British Society of Interventional Radiology (BSIR)	Access for DGH to OOH IR	Large DGH need to have access to treat acute bleeds what is the provision and pathway		
44	Deltex Medical	Detection and treatment of covert bleeding/ hypovolaemia	Untreated hypovolaemia is compensated for by redistributing blood away from some abdominal organs in favour of the heart and brain. Prolonged gut hypoxia damages tissues, allowing bacteria and toxins to leak into the bloodstream, resulting in a number of potential complications.	A study assessing the ability of emergency clinicians to correctly predict haemodynamic parameters found that they were only correct ~50% of the time. Once aware of actual haemodynamic values they altered treatment in 30% of cases. http://journals.lww.com/ccmjournal/Citation/1999/12001/HEMODYNAMIC_EVALUATION_OF_THE_CRITICALLY_ILL_IN.232.aspx	Early haemodynamic assessment with an accurate and precise technology is crucial. Oesophageal Doppler monitoring (ODM+) has already been proven effective intraoperatively (NICE MTG3), and with additional monitoring capabilities via an arterial pressure line (using the most reliable mathematical algorithm for deriving flow from pressure*) and non-invasive high-definition impedance cardiography (HD-ICG), the ODM+ is a valuable tool for comprehensive monitoring and management from emergency admission, across the perioperative

					period, and in the intensive care setting. *Sun, J.X., et al., *The cardiac output from blood pressure algorithms trial.* Crit Care Med, 2009. 37(1): p. 72-80. Monge Garcia, M.I., et al., *Impact of arterial load on the agreement between pulse pressure analysis and esophageal Doppler.* Crit Care, 2013. 17(3): p. R113. Caillard, A., et al., *Comparison of cardiac output measured by oesophageal Doppler ultrasonography or pulse pressure contour wave analysis.* Br J Anaesth, 2015. 114(6): p. 893-900. Zhang, J., L.A. Critchley, and L. Huang, *Five algorithms that calculate cardiac output from the arterial waveform: a comparison with Doppler ultrasound.* Br J Anaesth, 2015. 115(3): p. 392-402.

					Broch, O., et al., *Accuracy of Cardiac Output by Nine Different Pulse Contour Algorithms in Cardiac Surgery Patients: A Comparison with Transpulmonary Thermodilution.* Biomed Res Int, 2016. 2016: p. 3468015.
45	Society and College of Radiographers	Key area for quality improvement 2 **1.11.3 Access to major trauma services**	Diagnostic Imaging and Interventional Radiology should be "equally and immediately" available to allow the severely injured patient the same outcome regardless of time of day or day of the week. This should include the immediate availability of whole body CT of multiple injuries to optimise diagnosis and when required, interventional radiology	Specialist diagnostic services (CT and intervention) should be staffed by radiographers who are trained, educated and competent to deliver the same standard of care around the clock. Staffing rosters should be designed to optimise skill mix. Communication methods, call out and response times amongst radiographic services are not standardised.	See the RCR document: Standards of practice and guidance for trauma radiology in severely injured patients. https://www.rcr.ac.uk/sites/default/files/docs/radiology/pdf/BFCR(11)3_trauma.pdf http://www.nhs.uk/NHSEngland/AboutNHSservices/Emergencyandurgentcareservices/Documents/2016/MTS-map.pd

46	SCM 2	5. Consideration of a standard for MRI availability/timing as the recent NICE guidance has recommended an increased role for MRI, particularly in children.	Consideration of a standard for MRI availability/timing as the recent NICE guidance has recommended an increased role for MRI, particularly in children.	MRI is often difficult to access out of hours particularly in Trauma Units.	Well known in trauma circles.
47	SCM 2	2.Early access to CT for trauma cases	NICE guidance is clear (for head injuries) but the recommendation is frequently not met.	TARN data shows that many patients are falling outside the one-hour guidance from CT request to result.	TARN
48	SCM 3	Trauma CT imaging in children to happen within 60 minutes of arrival, in those that ultimately require CT	The current 30 minute time to CT standard is arbitrary and adult derived. Evidence exists that children are scanned too frequently (high negative CT rate) and when CT is performed Royal College of Radiology guidelines are not followed on selective scanning and multiple body regions are often scanned. This increases the total radiation dose for little additional clinical benefit and can increase the likelihood of later developmental cancers.	Allowing further time for clinical assessment means more rational imaging decisions can be made which takes time and may incorporate use of other imaging modalities such as plain x-ray. The 30 minute to CT scan time can drive poor practice where children are scanned rapidly and head to toe when only a CT abdomen is actually indicated, or sometimes no imaging at all. TARN data exists to show that this is more likely to occur if a child arrives outside a paediatric major trauma centre.	Severe Injury in Children 2013-14 (Trauma Audit and Research Network)
49	SCM 4	Whole body CT from vertex to toes –spinal injury and complex fracture guidelines	Spinal injury and complex fracture guideline I was surprised that a whole body CT does not normally cover the legs. A full scan would mean patients would not need further diagnostic imaging and could be taken to theatre quicker.	Clearer definition of whole body/ partial body CT required. Practice varies across the country.	Spinal injury and complex fracture guideline

Image reporting					
50	SCM 4	A&E radiology reporting	Patients would not leave A&E without a clear diagnosis. This would reduce the risk of missed fractures, further injury or delays in being called back.	Better practice. Should reduce the number of missed fractures.	Non-complex fracture guideline
51	Society and College of Radiographers	1 **Immediate hot reporting** of images of complex fractures, major trauma, hip fractures, spinal fractures and non-complex fractures by appropriately **trained and qualified staff**. Staff trained and qualified to report images usually comprise a team of Radiologists, Reporting Radiographers or other registered professionals that hold a postgraduate image interpretation **qualification.**	NICE offer evidence-based recommendations for the assessment of non-complex fractures, hip fractures, spinal fractures, complex fractures, and major trauma. NICE advocate that images must be reported immediately in the emergency department (hot reported) by appropriately trained staff. The guidance is not currently implemented in a large number of emergency departments. A result is that missed fractures are listed as one of the top three litigation costs reported by NHS Litigation authority.	Missed fractures result in time off work, expense and prolonged suffering for the affected patients, work load pressures and cost for the NHS and once litigation ensues, further cost, pressure on the justice system and stress for the medical and paramedical staff involved. Missed fractures have been discussed in the medical literature on many occasions, over many decades, yet little seems to have changed. To minimise the chance of misinterpretation NICE guidance must take priority for quality improvement: emergency care patients should always have an immediate (hot) report from an appropriately trained member of staff. Appropriately trained staff hold a postgraduate qualification, regularly audit their practice & discrepancies	http://www.nhsla.com/AboutUs/Documents/NHS_Litigation_Authority_Annual_Report_and_Accounts_2015-2016.pdf NHS Litigation authority annual report 2015-2016. https://www.rcr.ac.uk/sites/default/files/bfcr061_standardsforreporting.pdf Royal College of Radiologists Standards for the reporting and interpretation of imaging investigations. https://www.rcr.ac.uk/system/files/publication/field_publication_files/BFCR%2812%299_Team.pdf The Royal College of Radiologists and The College of Radiographers: Team working in clinical imaging

					Hardy M, Hutton J, Snaith B. Is a radiographer led immediate reporting service for emergency department referrals cost effective? Radiography 2013; 19: 23-7. Snaith B, Hardy M. The perceived impact of an emergency department immediate reporting service: An exploratory survey. Radiography 2013: 19: 92-6.
4.5 Pain management					
52	Royal College of Anaesthetists	4 Analgesia in major trauma	Need to look at pain scores during whole patient stay.	Concern is that analgesia is not being delivered effectively - and full range of options such as regional anaesthesia catheters are not being used to full extent.	
53	Royal College of General Practitioners	Analgesia (emergent practice)	Where early application of gold standard Rapid Sequence Intubation cannot be guaranteed, provision should be made for effective analgesia during transport beyond that available with opiates alone. This should include the option of continuous intravenous ketamine infusion.		

4.6 Spinal injury and fractures					
Spinal immobilisation					
54	SCM 2	4.Key area for quality improvement 4	Consider how we can improve 'immobilisation' of the spine for patients with actual or suspected spinal injury.	A significant number of patients suffer a 'second' injury due to inappropriate patient 'handling' post injury. This occurs when there is a spinal column fracture but little or no cord involvement. Poor immobilisation can then damage the cord.	Co-author on recent publication, Todd et al (Bone Joint J 2015;97-B:527-31
Pelvic fractures					
55	College of Paramedics	Pelvic trauma			
56	SCM 1	Pelvic fracture care	The Major Trauma complex fracture guideline recommends the use of a pelvic binder where bleeding is suspected.	Practice in this area still varies greatly with some systems applying binders based on mechanism of injury and others waiting for signs of obvious shock. Further work is required to understand the efficacy of these devices in the pre-hospital phase.	
Open fractures					
57	College of Paramedics	Open fracture/dislocation			
58	SCM 4	Giving IV antibiotics early - in pre-hospital setting if possible	This could have a significant impact on the ambulance service. It could reduce the risk of infection in major trauma cases and may speed up time to surgery. .	Impacts upon the ambulance service. Would need to be implemented nationally.	Complex fracture guideline.

59	SCM 4	Storage of photographs of wounds	Complex fracture guideline. Trusts to have suitable IT/Governance agreements to enable photographic documentation to be taken and stored. This would mean that the wound could remain covered until the patient is taken to theatre. It could reduce the risk of further infection.	Some hospitals have formal arrangements but this is not standard across all Trusts.	Complex fracture guideline.
4.7 Information and support for patients, family members and carers					
60	SCM 1	Communication with families	The Major Trauma Assessment and Initial Management guideline provides guidance on communicating with families. Often communication in the pre-hospital phase is poor. Ambulance clinicians are not always trained to provide such support.	Ambulance crews often come into contact with family members before formal diagnosis of injuries and at a stressful point in the patient's injury journey. Poor communication at scene or during transfer stays with families for years to come.	
61	SCM 5	Patient and family information	The NICE guidelines on major trauma identify a need to provide clear and consistent information to families of trauma patients. This should include information on treatments, transfers and outcomes.	Patients and families who have suffered major trauma are thrown into a world of chaos and confusion. As well as dealing with the injuries, uncertainty and complex information make things harder to deal with. Patient well-being can be improved by good and sensitive information handling.	Patient involvement in thier own care and priorities improve outcome. A first step making this best practice is to make sure they are properly informed. http://www.city.ac.uk/news/2017/february/focusing-on-injury-recovery-from-trauma-patients-point-of-view

					Qualty standards in patient experience https://www.nice.org.uk/guidance/qs15/chapter/List-of-quality-statements
62	SCM 5	Points of contact	NICE guidelines on major trauma service delivery identify the need for single points of contact and dedicated staff to deal with provision of information as well as taking responsibility for unaccompanied children and vulnerable adults	Having clearly identified staff with sole responsibility for pastoral care of patients avoids delay and confusion in extreme situations.	https://www.nice.org.uk/guidance/NG40/chapter/Recommendations#information-and-support-for-patients-family-members-and-carers
Additional areas					
Data submission to TARN					
63	Royal College of Emergency Medicine	5 Complete TARN data submission	The TARN database underpins all assessment of the quality of trauma care.	Review of the TARN website identifies who many Trauma Units do not submit adequate data - either in terms of completeness or quality.	Poor case ascertainment prevents adequate TARN outlier monitoring of hospitals and regional trauma networks, reduces the accuracy of major trauma clinical audit and therefore endangers patient safety. CQC inspections from 2018 will use national clinical audit data to grade hospital performance

64	SCM 3	Submission of good quality, accurate trauma data to the Trauma Audit and Research Network to be higher than 75% of all eligible patients submitted within 25 days of discharge or death.	Accurate data is essential for understanding the evolution of trauma care in the UK and currently some trauma receiving centres and units have submission rates as low as 20%. This makes assessment of care being delivered in key clinical areas almost impossible. This could drive data submissions up towards levels that make national analyses and comparisons meaningful	If it were possible to link the Best Practice Tariff to a units overall performance in relation to data submission then the emphasis is taken away from submission of individual patient data and towards the provision of a service for capturing and submitting data on all patients	TARN
Distal femoral fractures and hip fractures					
65	Royal College of Nursing	1 Distal femoral fractures – should be treated the same as hip fractures – time to theatre within 36 hours; orthogeriatric involvement (shared care with Orthopaedics and Orthogeriatrics),	People with distal femoral fractures are generally from the same cohort as the hip fracture patients and share similar (or probably higher now) mortality and morbidity risks. However, people with distal femoral fractures are not treated as well as the hip fracture patients whose quality of care is set out in the NICE quality standard. Improving the quality of care of patients with distal femoral fractures would reduce the mortality and morbidity rates in line with the hip fracture patients.	These patients are treated in line with general trauma patients with no standard for care and treatment. They are generally elderly and frail. Orthogeriatric involvement is often non-existent so, care is poor.	T. Koc, L. McMenemy, G. Shaw, A. Gandhe, T. Kane (2016) Mortality rates following distal femoral fractures. Paper presented by authors from Queen Alexandra Hospital Portsmouth at the Fragility Fracture Network Congress 2016 showed these patients had the same mortality and morbidity risks as hip fracture patients but received poorer care. http://fragilityfracturenetwork.org/our-organisation/5th-ffn-

					global-congress-2016/programme/ NICE Hip fracture in adults (QS16) (2017) NICE Quality Standard
66	Wirral University Teaching Hospital	The standard for fracture neck of femur measures the time from admission to theatre. A small but not insignificant number of patients may sustain a fracture whilst inpatient or may initially not be diagnosed as having a fracture neck of femur. Those patients would be marked as failures for no fault of the fracture neck of femur pathway. It would be more appropriate to allow the time to be measured from diagnosis in those patients who are admitted initially for a different condition.			

Orthogeriatric review for elderly patients					
67	Royal College of Emergency Medicine	4 Elderly - all older trauma patients should have an orthogeriatric review within 48 hours of admission.	It is well recognised that the increasing older population make up a significant segment of the older population and have complex care needs and co-morbidities.	"TARN's 2017 report: Major Trauma in Older People" highlights a range of deficiencies in the care provided to this patient population.	Not aware of any specific database though the TARN database would allow easy identification of this patient population.
Evidence on pre-hospital medical care					
68	College of Paramedics	Evidence relating to paramedics with enhanced competencies			
69	Faculty of Intensive Care Medicine/Intensive Care Society	Access to pre-hospital medical care	There is a lack of quality evidence as to the value and cost-effectiveness of pre-hospital medical care. Increasing amounts of third sector funding and senior clinician time is committed to the provision of pre-hospital medical care (the clinicians involved are most commonly from emergency medicine and anaesthetics / critical care).		
Injury prevention programmes					
70	Faculty of Intensive Care Medicine/Intensive Care Society	Prevention	Improvement in the quality and effectiveness of injury prevention programmes especially among the elderly are overdue. Without changes to the number of patients who sustain major trauma, the costs for associated healthcare are only going to increase.		

Radiographer-led discharge					
71	Society and College of Radiographers	3 Additional developmental areas of emergent practice - **Radiographer led discharge**	Radiographers can safely extend their roles outside of the radiology department and contribute to the management of patients whilst decreasing risk of radiographic misinterpretation by A&E.		https://www.england.nhs.uk/wp-content/uploads/2017/01/ahp-action-transform-hlth.pdf Snaith BA. Radiographer discharge in A&E: the results of a pilot project. Radiography 2007; 13: 13-7. https://www.researchgate.net/profile/Bev_Snaith/publication/223348940_Radiographer-led_discharge_in_accident_and_emergency_-_The_results_of_a_pilot_project/links/004635352eaf3029b4000000.pdf Emerg Med J. 2013 Apr;30(4):298-302. doi: 10.1136/emermed-2011-200642. Epub 2012 Apr 25. Assessment of a reporting radiographer-led discharge system for minor injuries: a prospective audit over 2

					years. Henderson D1, Gray WK, Booth L. http://www.nhswalesawards.wales.nhs.uk/searchresults/?q=radiographer+led+discharge&site=orgid*1086&requiredfields=DC%252Elanguage%3Aeng&orgid=1086
Staff training					
72	NHS England	The development of defined training pathways to ensure that major trauma networks have the manpower to maintain the highest standards of care.	At present there remain issues within networks where there are gaps in rotas and not enough appropriately skilled doctors to provide urgent lifesaving surgery to major trauma victims.	There are opportunities which become time dependant for lives to be saved with timely emergency surgical intervention The RCS has published reports highlighting these workforce issues Through HEE 5 major trauma transitional fellowships are being developed, but these will not be enough. Training to support trauma networks requires incentivisation, organisation and a long term plan to ensure trauma victims are met at the scene and the front door of units by a complete trauma team	N Tai and M Bircher, Trauma Systems in England-a strategy for Major Trauma Workforce Generation and Sustainability, March 2014, Royal College of Surgeons of England Briefing Note 2015: Major Trauma Workforce Sustainability RCS England website

73	Royal College of Nursing	2 Education of nurses working in the Trauma wards	Access to post-graduate courses for nurses working in trauma wards is difficult – there are few courses available. However, it is known that improving education improves care for the patients.	Lack of education for Trauma nurses leads to an increased mortality risk for trauma patients.	Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study. Prof Linda H Aiken, et al. The Lancet. Volume 383, No. 9931, p1824–1830, 24 May 2014 http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(13)62631-8/fulltext#?via=sd&cc=y
74	The Royal College of Surgeons of Edinburgh	4 - Training	Improved training to ensuring that all rotations / training schemes give trainees maximal exposure to simple and complex trauma in good volumes. All should have some experience of MTC. Consultants are skilled / upskilled appropriately to perform the necessary roles. Encouragement of T & O surgeons to become involved in the subspecialty of Trauma - this needs appropriate job planning, remuneration and cpd.	The reality is that for many people trauma is stressful due to the wide ranging demands on the consultant, poor resources (beds/rehab/ training/cpd) Cases which should be grouped to develop expertise are often widely spread among different facilities diluting experience and the relative infrequency of on call and lack of facilities out hours means that it is easy to become deskilled. Ultimately, we need a national plan.	

			In addition, currently the SAC do not mandate that trainees must spend time in MTC's as these are not present in all training rotations. We would recommend that all are trained in the management of major trauma which allows some flexibility for TPD's to set-up training which suits their particular regions and facilities. We believe that this flexibility should be retained going forward.		
Helicopter emergency medical systems					
75	Resuscitation Council (UK)	1 Increased availability of helicopter emergency medical systems (HEMS) for trauma patients.	There is an increasing amount of evidence from many countries that the use of helicopters improves outcome after major trauma.	There is evidence that both adults and children have improved survival when treated by systems using HEMS. There is also evidence that trauma patients treated within a HEMS system have lower complication rates, e.g. Multiple Organ dysfunction Syndrome, (MODS), sepsis. HEMS systems result in reduced transfer times to trauma centres, and secondary transfers.	Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine. 2016 Nov 29;24(1):140. Journal of Trauma and Acute Care Surgery. 2016 May;80(5):702-10. doi: 10.1097/TA.0000000000000971. Critical Care. 2013 Jun 21;17(3):R124. doi: 10.1186/cc12796. PLoS One. 2016 Jan 15;11(1):e0146897. doi: 10.1371/journal.pone.0146897. eCollection 2016.

					Acta Anaesthesiologica Scandinavica. 2013 May;57(5):660-8. doi: 10.1111/aas.12052. Epub 2013 Jan 7.
Sepsis					
76	Deltex Medical	Early identification of sepsis	"Implementation of protocolized hemodynamic optimization in the ED for patients with severe sepsis and septic shock appears to reduce mortality. The development of ED protocols to identify patients with severe sepsis and septic shock and achieve resuscitative endpoints merits strong consideration given the results from this meta-analysis." https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3952890/	The Surviving Sepsis Campaign produced recommended guidelines for treatment. Compliance with the bundle guidelines is low, despite a significant effect on mortality. https://www.ncbi.nlm.nih.gov/pubmed/26109396	Early haemodynamic assessment with an accurate and precise technology is crucial. Oesophageal Doppler monitoring (ODM+) has already been proven effective intraoperatively (NICE MTG3), and with additional monitoring capabilities via an arterial pressure line (using the most reliable mathematical algorithm for deriving flow from pressure*) and non-invasive high-definition impedance cardiography (HD-ICG), the ODM+ is a valuable tool for comprehensive monitoring and management from emergency admission, across the perioperative period, and in the intensive care setting