

Early management of the severely injured major trauma patient

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Editors's key points

- The trauma team must function as a unit with effective leadership and a clear understanding by team members of their roles.
- Repeated briefing and review maintains clinical through the numerous transitions involved in the care of trauma patients.
- A higher rate of failed intubation is seen in trauma patients than in other groups.
- During intra-operative care, the patient's status should be reviewed every 10–30 minutes and the surgical plan modified if necessary.

Major trauma networks have recently been developed in England to provide optimal management of the severely injured patient. Numerous reports have highlighted the past problems in trauma care in the UK and the recent reorganization seeks to address these deficiencies.^{1–3} This reorganization is based on the improved survival and outcomes observed when severely injured patients present to specialized (major trauma) centres (MTCs) that treat sufficient numbers and have a coordinated, multidisciplinary team to receive, resuscitate, and provide definitive care.^{4,5}

This restructuring of major trauma care is the first nationally coordinated change trauma services since the inception of the National Health Service 60 yr ago and the first attempt at developing a national system to provide high-quality trauma care for the population in England. Twenty-six regional trauma networks have been established; each network has been designed to best serve the local geography, population and infrastructure. The East Midlands Major Trauma Network covers a population of 4.3 million and consists of one MTC with five supporting trauma units (TU). Severely injured patients are identified using a triage tool and are taken directly to the MTC if the journey time is <45 min or to the nearest TU if the patient has an immediate life threatening injury. Patients >45 min from the MTC are taken to the nearest TU for resuscitation, evaluation, and detailed triage. Secondary transfer then will take place to the MTC if required. Other hospitals with A&E departments, designated as Local Emergency Hospitals, which do not have the facilities to receive major trauma patients are always by-passed by the pre-hospital system.

The major trauma team relies on an efficient, communicative team to ensure patients receive the best quality care. This requires a comprehensive handover, rapid systematic review, and early management of life- and limb-threatening injuries. These multiple injured patients often present with complex conditions in a dynamic situation. The importance of team work, communication, senior decision-making, and documentation cannot be underestimated.

Keywords: patient care; resuscitation; teams; wounds and injuries

Trauma call activation

At the receiving hospital, there should be agreed predefined activation criteria for a trauma call.⁶ These are most usually based on mechanism of injury, acute physiology, and anatomical factors. However, there is currently no agreed national consensus on the criteria used, and within units some discretion is exercised on a case-by-case basis. Activation of a Major Trauma Call before patient arrival (pre-alert) depends upon the accuracy of pre-hospital information.

The trauma team

In most institutions, the trauma team will have predetermined members. It usually comprises emergency department (ED) physicians, anaesthetists, general and orthopaedic surgeons, with some units providing a radiologist, neurosurgeon, and intensive care physician.² Exact membership and seniority will vary according to time of day, shift changes, other hospital activity, and so forth. The trauma team leader can come from any of the specialities, most usually from ED in England. The quality of leadership is paramount to the safe and efficient running of trauma calls.⁷ Ideally the trauma team should be (pre)-alerted and attend the ED before the arrival of the patient. This provides time for introductions and briefing with respect to roles and expertise of team members, to check equipment, to share available patient information, to plan and prepare for anticipated therapeutic and diagnostic interventions.

Whilst trauma team leadership is pivotal in these high stakes, complex, and dynamic clinical situations, so too is team followership, and training should focus on both roles. Pro-

viding the desirable high-quality, consistent, trauma team training, and experience for trainees and consultants across all TU and MTCs is a significant national challenge. Historically, medical training has focused on knowledge and skills, that is, technical factors. However, in recent years, there has been increased understanding and focus on human factors and, in particular, non-technical skills. These have been described for anaesthetists by the Anaesthetic Non-Technical Skills (ANTS) system.⁸ The four skill categories described (task management, team working, situation awareness, and decision-making) are all critical determinants of successful trauma resuscitation.

The anaesthetist often contributes to the trauma team in a non-leadership role, which is entirely appropriate given the very task-orientated role of airway and breathing assessment and management. However, the position at the head of the patient presents a unique overview of both the patient and situation as a whole. In addition to specialist airways skills, anaesthetists bring to the major trauma situation their skills in the recognition and management of acute physiological derangement, including haemorrhage and shock. Findings and concerns should be clearly communicated to the team leader.

The anaesthetist is often the primary clinician providing direct continuity of care through the early part of the patient's pathway in the hospital. Multiple team and place transitions can be particularly difficult, but the use of repeated briefing and review can ensure agreed clinical understanding, shared goals, and planning to optimize team resource management. Checklists can be very helpful for equipment preparation, and can also be used to enhance safety at critical interventions and at key transitions, such as transfer to computerised tomography (CT) scan, theatre, or critical care. Transfer to these different environments necessitates safe handover of care at a time when information loss and corruption is a potential hazard. Emergency checklists can also be helpful in unusual or stressful situations such as the 'non-responder'.

The factors most commonly causing clinical problems are decision-making and effective communication within and between teams. Particular attention needs to be paid to documentation of decisions and interventions.

Patient reception and resuscitation in ED

The objectives in ED are to undertake a rapid and systematic clinical assessment; to institute immediately life-saving treatment; to use information gleaned clinically and from imaging (focused assessment with sonography in trauma and CT) to decide the most appropriate patient pathway; and safe and timely patient transfer with clear forward communication.

In the ED, the trauma team receives the patient after a comprehensive, clear handover is delivered and heard by the whole team.

The importance of a handover by paramedics transferring the patient cannot be underestimated. They have knowledge of the scene, mechanism of injury, patient condition, and pre-hospital management that will affect assessment and further

care. The MIST structure (M—Mechanism of injury; I—Injuries sustained or suspected; S—vital Signs at the scene and on transport; T—Treatment and response)⁹ is a useful tool for handover and forward communication.

Initial assessment is managed according to Advanced Trauma Life Support (ATLS) principles with airway and cervical spine control taking priority but with management of ABC's in parallel rather than sequence.¹⁰ Primary survey findings are clearly communicated to the team leader and documented. The one exception to the 'ABCDE' approach of ATLS is uncommon in civilian practice but can occur, particularly in the context of penetrating wounds, when exsanguinating external haemorrhage poses the most immediate threat to life and must be controlled as a priority.

Immediate haemorrhage control

This can be achieved in the limbs by direct pressure to the wound and immediate application of a pneumatic tourniquet with the tourniquet time clearly documented in indelible ink on the patient.¹¹ In injuries of the junction of the thigh-groin and arm-axilla it is not possible to apply a tourniquet and haemorrhage control relies on direct pressure and packing. Control of haemorrhage from this 'junctional trauma' can be very difficult as large vessels are involved and often retract from the wound site. These patients may require emergent surgical haemorrhage control in theatre.

Airway with cervical spine control

Decision-making with respect to the need, timing, and method to achieve a definitive airway can be very challenging. Clear indications for intubation include actual and impending airway compromise. However, intubation and ventilation may also facilitate safe imaging, transfer, and required interventions in the shocked patient or the very agitated patient. In the presence of multiple painful or distressing injuries, when the inevitable destination of the patient is theatre or the intensive care unit, early anaesthesia, intubation, and ventilation is humane and offers best analgesia. NICE offers guidelines in the context of brain injury.¹²

Experienced clinical assessment will help to determine the need for a definitive airway and its urgency; the risks of securing a definitive airway vs not doing so; and the best intubation strategy. The decision-making, planning, and preparation should be shared with the rest of the trauma team.

There is clear evidence from NAP4 that trauma intubations are more difficult: there is a higher rate of failed intubation, surgical airway, and serious complications from emergency airway management.¹³ In addition to the requirement for cervical spine neutrality and pre-morbid or injury related patient factors, there are the additional factors of a high pressure, time-critical situation, a noisy environment, ongoing resuscitation, potentially unrehearsed team, equipment preparation, and checking.

Penetrating injuries to the neck pose considerable challenges to the anaesthetist. Both intubation and surgical access to the trachea may be difficult when bleeding into the

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