



National Audit Office

**REPORT BY THE
COMPTROLLER AND
AUDITOR GENERAL**

**HC 213
SESSION 2009–2010**

5 FEBRUARY 2010

Major trauma care in England

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National Audit Office

Major trauma care in England

Ordered by the House of Commons
to be printed on 3 February 2010

Report by the Comptroller and Auditor General

HC 213 Session 2009–2010
5 February 2010

London: The Stationery Office
£14.35

This report has been
prepared under section 6
of the National Audit Act
1983 for presentation to
the House of Commons
in accordance with
Section 9 of the Act.

Amyas Morse
Comptroller and
Auditor General

National Audit Office

2 February 2010

This report evaluates major trauma services in England and identifies what improvements need to be made. We examined the effectiveness of the planning and delivery of services across the patient pathway, and the quality of care provided, including patient outcomes.

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Summary

1 Major trauma describes serious and often multiple injuries where there is a strong possibility of death or disability. In England, the most common cause is a road accident. We estimate that there are at least 20,000 cases of major trauma each year in England resulting in 5,400 deaths and many others resulting in permanent disabilities requiring long-term care. There are around a further 28,000 cases which, although not meeting the precise definition of major trauma, would be cared for in the same way.

2 There are currently 193 hospitals in England that provide major trauma services within their emergency departments. Major trauma is, however, a minor element of emergency department work equating to less than 0.2 per cent of total activity. We estimate that major trauma costs the NHS 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. We estimate that the annual lost economic output as a result of major trauma is between £3.3 billion and £3.7 billion.

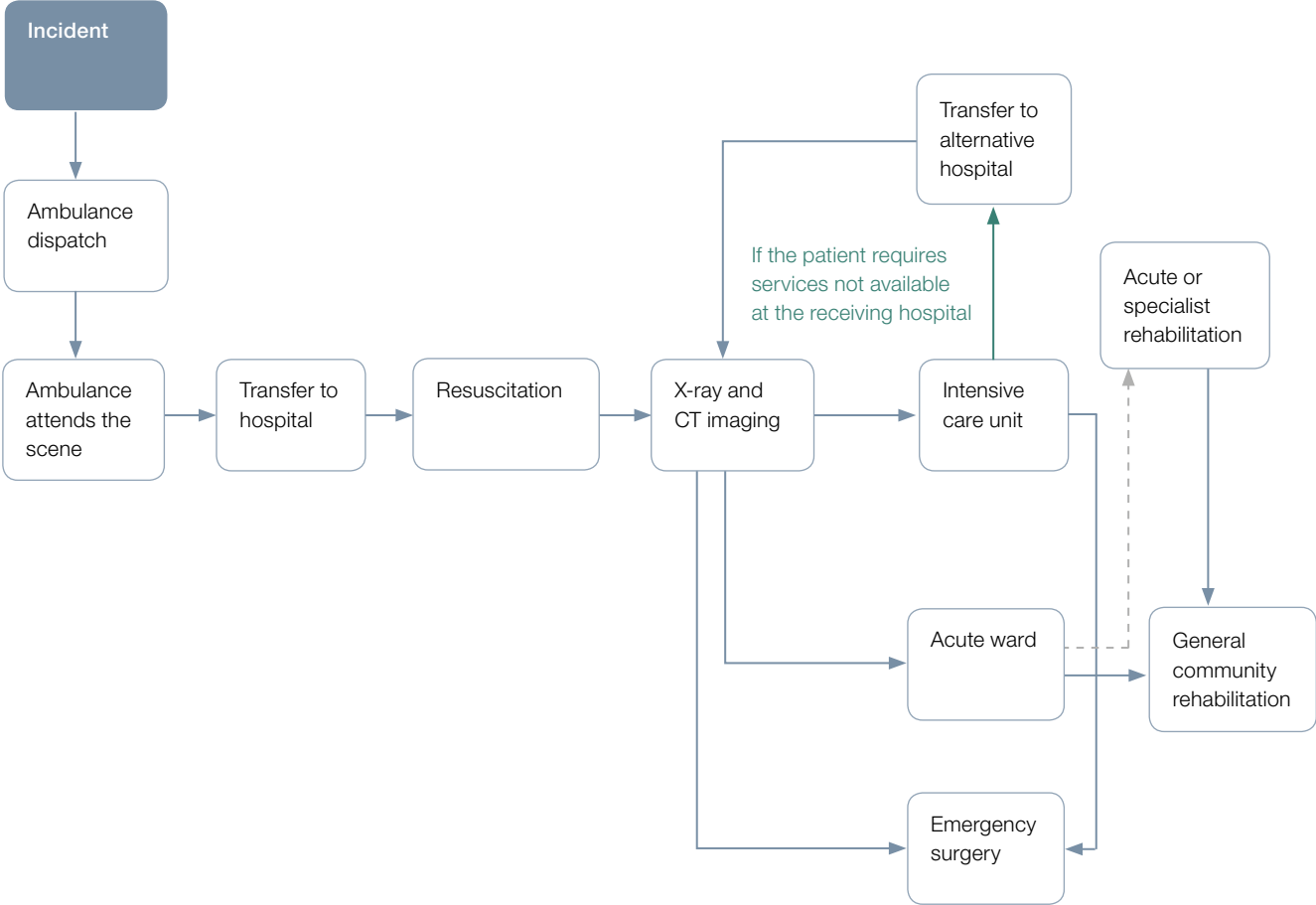
3 Since 1988, a number of studies have identified deficiencies in the care provided to severely injured patients in England. There has, however, been little progress in addressing these deficiencies and recent research has identified a 20 per cent higher in-hospital mortality rate for trauma patients in England compared to the US.

4 In 2008, Lord Darzi's NHS *Next Stage Review*, reported that there were 'compelling arguments for saving lives by creating specialised centres for major trauma' and strategic health authorities were asked to develop regional plans on this basis. No timescales were set for the completion of this process. The Department of Health (the Department) is supporting the work through its Regional Trauma Networks Programme and, on 1 April 2009, appointed the first National Clinical Director for Trauma Care to lead the development of clinical policy. The Director is leading the NHS in delivering the changes required to achieve effective implementation of regional networks and ensuring service engagement in this process (see Part Four page 30).

5 The best data currently available on the quality of major trauma care are collected by the Trauma Audit and Research Network (TARN). These data include pre-hospital times, mechanism of injury, injury severity, times to treatment, length of stay, and outcomes based on mortality. The database uses a model to calculate the likely rates of survival for particular injuries or combinations of injuries, taking into account age, gender and the patient's physical response to their injuries. The database then compares the number of expected survivors against the number of actual survivors to produce a rate of survival for each hospital adjusted by the complexity of the major trauma case.

6 This report evaluates major trauma services in England and identifies what improvements need to be made. We examined the effectiveness of the planning and delivery of services across the patient pathway (Figure 1), and the quality of care provided, including patient outcomes. We did not examine the NHS' preparations for unusually large incidents. Our methodologies are set out in Appendix 1. More details can be found on our website at www.nao.org.uk/publications.

Figure 1
The current patient pathway for major trauma



Source: National Audit Office

Overall findings

7 Despite repeated reports identifying poor practice, the Department and NHS trusts have taken very little action to improve major trauma care. Deficiencies in major trauma care were identified by the Royal College of Surgeons in 1988, but there has been little progress since. In 2007, a report by the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) concluded that 60 per cent of major trauma patients received a standard of care that was 'less than good practice'. A number of reports, including one by the NAO in 1992, have made recommendations about the information and actions required to improve the delivery of major trauma care, but there remain significant data gaps and a lack of formalised systems.

8 Survival rates for major trauma vary significantly between hospitals, reflecting variations in the quality of care. Data from TARN, to which 114 hospitals (59 per cent of hospitals delivering trauma care) voluntarily submit trauma data for analyses and comparison, show a range of outcomes following trauma from five unexpected survivors to eight unexpected deaths per 100 trauma patients. The performance of the 41 per cent of trauma receiving hospitals that do not submit data to TARN cannot be gauged.

9 As major trauma is a relatively small part of the work of an emergency department, optimal care cannot be delivered cost-effectively by all hospitals. People who have suffered major trauma often have multiple injuries which need to be treated by different surgical specialties. Whilst specialties such as orthopaedic surgery are commonly available in hospitals, this is not the case for neurosurgery or cardiac surgery. A generally acknowledged solution to this issue is the development of trauma networks where hospitals and the ambulance service work in a coordinated way to provide timely access to specialist care day and night through a system of protocols to deliver the most serious cases to those best equipped to deal with them.

10 Evidence shows that care should be led by consultants experienced in major trauma, but major trauma is most likely to occur at night-time or at weekends when consultants are not present in emergency departments. Having a dedicated consultant present in an emergency department produces quicker and better decision-making in the care of major trauma patients. Yet our evidence indicates that consultants are most likely to be present only between 8am and 8pm Monday to Friday, with night-time and weekend cover provided on an on-call basis. Only one hospital has 24-hour consultant presence seven days a week.

11 The delivery of major trauma care lacks coordination and can lead to unnecessary delays in diagnosis, treatment and surgery. There are currently no formal protocols for determining where people should be taken for treatment, nor a formal system for transferring patients between hospitals. TARN data show that only 36 per cent of patients requiring a transfer from one hospital to another more specialist facility actually get transferred and, for those who are transferred, the efficiency of the process often relies on ad-hoc arrangements. The remaining 64 per cent of patients do not receive specialist care and, as a result, may have a worse outcome.

12 Information on major trauma is not complete and quality of care is not measured by all hospitals. Data on major trauma is either lacking entirely, incomplete or is not brought together in a usable way. Not all hospitals contribute to TARN, and measures of quality almost exclusively focus on death during the initial period of hospitalisation. There are no agreed measures for assessing disability or morbidity and beyond that the physical, social and psychological impact of major trauma on those that survive is not monitored. This lack of data means that it is not possible to fully understand the effectiveness of the current or future organisation of major trauma care.

13 Ambulance trusts have no systematic way of monitoring the standard of care they provide for people who have suffered major trauma and opportunities for improving care may be missed. The clinical governance arrangements (quality and safety) linking pre-hospital and hospital care are weak, and data is not shared. The quality and safety arrangements that are in place in the NHS also do not link with those of voluntary providers such as air ambulance services.

14 The availability of rehabilitation varies widely across the country, and services have not developed on the basis of geographical need. Although rehabilitation may help to reduce length of stay, minimise hospital readmissions, and reduce the use of NHS resources following the initial period of hospitalisation, it has not been considered to any great degree by strategic health authorities in their reviews of major trauma services. There is a widely perceived lack of capacity for the specialist rehabilitation of major trauma patients, but with little hard evidence about what services are currently available and how well they are arranged to meet patient needs, it is difficult to reach a conclusion on this.

15 The costs of major trauma are not fully understood, and there is no national tariff to underpin the commissioning of services. Whilst cost cannot be a primary concern at the point of treatment, funding arrangements for major trauma care do not reflect the true costs incurred by the hospital trusts that treat higher volumes of trauma. If the regional trauma networks now planned are to be successful, trusts need to have appropriate funding arrangements that facilitate the easy transfer of patients to more specialist care and rehabilitation.

Value for money conclusion

16 The case for improving major trauma care in England was made 20 years ago, yet little action has been taken to make improvements since that time, and there remains a lack of accurate and complete information to inform the planning of services and assess the effectiveness of care provided. There are also unacceptable variations in mortality rates, depending on where and when a person receives treatment.

17 The low incidence and high complexity of major trauma means it is important to have well established systems in place, following recognised standards including: 24-hour attendance of consultants with experience in major trauma; major trauma teams in place to coordinate care; by-pass and transfer protocols; and the collection of accurate and complete information on treatment and outcomes. The published literature suggests that where trauma systems have been introduced, in-hospital mortality reduces by 15 to 20 per cent. On the basis of our estimate of 3,000 deaths in hospital from major trauma each year, this suggests an additional 450 to 600 lives could be saved each year across England.

18 The current absence of such systems and standards means that patients do not consistently receive timely and coordinated care, which leads to poorer patient outcomes and, in some cases, death. We conclude that major trauma care in England does not represent value for money because the service is not being delivered efficiently or effectively.

Recommendations

19 It is not feasible, nor efficient to expect all hospitals to have the facilities and skills to provide effective specialist treatment, 24 hours a day, seven days a week when the number of cases of major trauma is relatively small. To deliver improved value for money, major trauma services need to be better coordinated and organised across the patient pathway (Figure 1). We have identified a number of recommendations to improve trauma care through better use of existing resources and some initial investment in the development of networks.

20 The Department is supporting the introduction of trauma networks by strategic health authorities. However, given the lack of progress made in improving major trauma services over the last 20 years, we recommend that the following interim actions should be taken by September 2011:

- a** **Primary care trusts and ambulance trusts should** develop and implement triage protocols to determine which emergency departments seriously injured patients should be taken for treatment. This work **should be coordinated by strategic health authorities**.
- b** **Primary care trusts should** use their commissioning powers to require all acute and foundations trusts with emergency departments that receive trauma patients to submit data to TARN. The data collected should be used to inform the ongoing development of trauma networks.
- c** **Strategic health authorities with hospital trusts should** develop protocols for the transfer of patients requiring specialist care or surgical procedures not available at the receiving hospital.

21 Once implemented, the interim measures set out above will help underpin the development and operation of optimal trauma networks. However, if trauma networks are to succeed in the long term, the following issues must also be addressed:

- a** There remains a lack of accurate and complete information in hospitals and ambulance trusts on the treatment of people who suffer major trauma. In addition, other than mortality rates, there is also no information on patient outcomes. Without much improved data, it will be difficult to plan networked services effectively, and improve both quality and safety.
 - i** Working with the **Department, strategic health authorities should** develop measures of outcomes to enable the quality of major trauma services to be better assessed. These measures should cover the entire patient pathway from pre-hospital care through to acute care and rehabilitation.
 - ii** Using TARN data, **hospital trusts should** benchmark performance with other trusts to help identify best practice and ways to improve patient care.
 - iii** To meet their quality and safety (clinical governance) requirements, **ambulance trusts should** collect data on the resources dispatched and treatment provided, and link it with data collected by NHS acute trusts in order to monitor the quality and safety of care provided in the pre-hospital environment. These data should be used to identify the need for improvements in patient care.
 - iv** TARN data and ambulance trust data should be routinely analysed by **strategic health authorities** and **primary care trusts**, and used to performance manage trauma networks.
- b** There is a need to have clear standards and protocols in place so that major trauma patients are efficiently delivered to those best equipped to deal with them.
 - i** **The Department should** work with the National Institute for Health and Clinical Excellence (NICE) to develop standards for major trauma care. For example, these quality standards should recommend that there is 24-hour consultant presence in emergency departments treating major trauma patients.
 - ii** **Strategic health authorities should** work with **primary care trusts, ambulance trusts, hospital trusts and social care providers** to develop protocols for the effective delivery of major trauma care against the standards set by NICE. For example, protocols to ensure that computed tomography (CT) scans are undertaken within the times recommended by clinical guidelines.
 - iii** **Hospital and ambulance trusts should** develop procedures through which they can obtain assurance that defined clinical standards are being followed by their staff. These should also be agreed with pre-hospital care providers operating outside of NHS funding arrangements, such as air ambulances.

- iv **Strategic health authorities and hospital trusts should** develop protocols for improving the overall management of critical care capacity for all patients so as to reduce the transfer of patients for non-clinical reasons.
- c Major trauma patients often have complex neurological and physical problems which can require long-term care. There is clinical evidence which shows that early coordinated rehabilitation leads to better outcomes for a patient and can reduce the use of NHS services in the long term. However, little is known about existing capacity in rehabilitation services in both hospital and community settings, and whether this capacity is used well.
 - i **Strategic health authorities should** review the current organisation of rehabilitation services when considering their plans for developing trauma networks. This review should include examination of existing use and capacity of rehabilitation services for major trauma, and the identification of good practice where it may exist.

Part One

Introduction

1.1 Major trauma describes serious and often multiple injuries where there is a strong possibility of death or disability, and includes injuries to the head, neck, spine, chest, limbs, abdomen, pelvis and skin. In England, around 98 per cent of major trauma is caused by blunt force, and the most common mechanisms of injury are road accidents and falls. Major trauma can also be caused by assault, burns, blasts, crushes and self-inflicted injuries. Penetrating injuries, such as knife or gunshot wounds, account for only two per cent of major trauma.¹

1.2 Trauma is classified using an injury severity score – an anatomical scoring system – which retrospectively assigns a measure of severity ranging from zero to 75, with a score of 16 or greater signifying major trauma. Mortality increases with injury severity score, and a score of 75 signifies injuries which are unlikely to be survived (**Figure 2**).

Figure 2

Injury severity score group and mortality

Injury severity score	Percentage of major trauma patients	Percentage mortality of this injury severity score group
16-25	62.6	10.5
26-40	28.9	22.1
41-74	7.7	44.3
75	0.8	76.6

Source: Trauma and Audit Research Network (2009). Modelling Trauma Workload: A Project for the Department of Health.

NOTE

These data include patients injured between 2003 and 2007.

The extent of major trauma

1.3 Major trauma is the leading cause of death in people under the age of 40.²

A 2007 study of 795 major trauma patients carried out by the National Confidential Enquiry on Patient Outcomes and Death (NCEPOD) found that 75 per cent of major trauma patients were male, with a high concentration of those in the age range 16 to 20 (**Figure 3**). The study also found that the peak time for cases of major trauma arriving at emergency departments was Saturday night (**Figure 4**).

1.4 There are no complete data on the incidence of major trauma and related mortality in England. We estimate, however, that there were at least 20,000 cases of major trauma in 2007, leading to at least 5,400 deaths, of which around 2,400 occurred before arriving at hospital and 3,000 following admission. We estimate that there are a further 28,000 patients who are initially dealt with as major trauma cases, even though they are judged ultimately to have injury severity scores of between 9 and 15.

The cost of major trauma

1.5 The cost of treating major trauma within the NHS is not known with any clarity. We estimate, however, that major trauma costs the NHS somewhere between £0.3 billion and £0.4 billion a year. This estimate is calculated on the basis of the average costs of treating blunt and penetrating trauma collected through academic research,^{3,4} and our estimate of the number of cases of major trauma.^a It includes the cost of ambulance transportation, the immediate hospital stay, and the cost of all procedures performed during that stay. The costs of longer-term treatment and rehabilitation following discharge from hospital are not known, but research suggests that for major trauma the majority of the costs are incurred following the initial period of hospitalisation.³

1.6 Deaths and serious injury as a result of major trauma also lead to indirect costs related to lost economic activity. On the basis of Department for Transport data and our estimates of the number of cases of major trauma and the resulting deaths and injuries,⁵ the annual lost economic output is between £3.3 billion and £3.7 billion (at 2007 prices).

Previous reports identifying deficiencies in trauma care

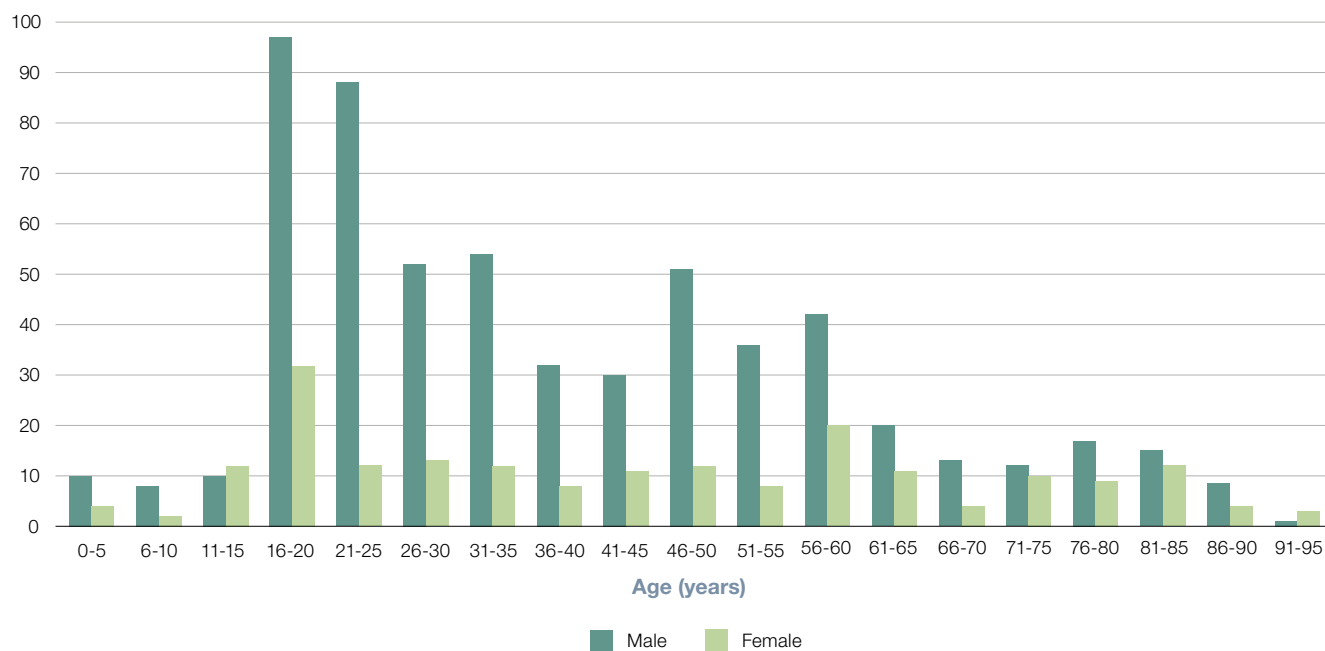
1.7 Since 1988, a number of reports and studies have identified deficiencies in the care provided to severely injured patients in England. Despite initiatives in the early 1990s, including the development of TARN and a pilot major trauma centre at North Staffordshire Royal Infirmary, there has been little progress in addressing these deficiencies (**Figure 5** on page 14). Recent research has also identified a 20 per cent higher in-hospital mortality rate for trauma patients in England compared to the US.⁶

a Our estimate of the number of cases of major trauma was calculated on the basis of Office for National Statistics (ONS) mortality data for 2007 and TARN data submitted by 20 hospitals over the five years between 1 January 2003 and 31 December 2007. These 20 hospitals were selected on the basis of having submitted data of continuous quality and were found to be a representative sample of the ONS data on the basis of the distribution of mortality, gender, and mechanism of injury. See detailed methodology on our website at www.nao.org.uk/publications.

Figure 3

Trauma patients by age and gender

Number of patients

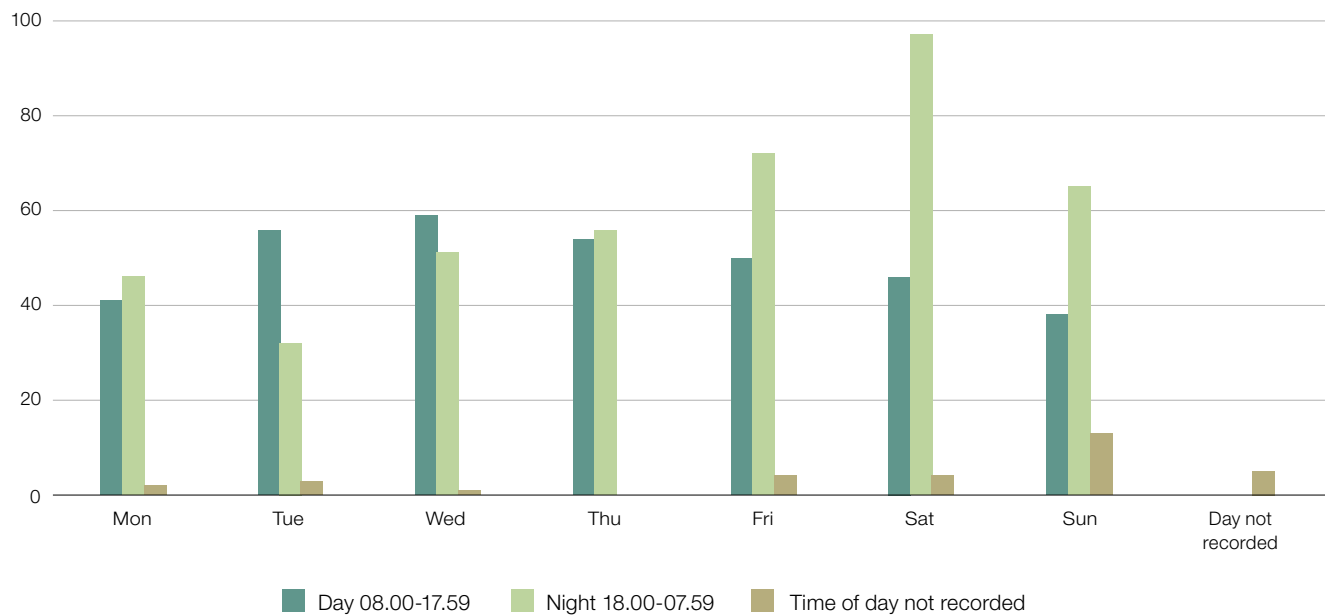


Source: The National Confidential Enquiry into Patient Outcome and Death (2007). Trauma: Who cares?

Figure 4

Trauma patients' time of arrival at hospital

Number of patients



Source: The National Confidential Enquiry into Patient Outcome and Death (2007). Trauma: Who cares?

Figure 5

Trauma care since 1988

1988 A retrospective study of 1,000 deaths from injury in England and Wales finds that, of the 514 patients admitted to hospital alive, 170 deaths (33 per cent) were preventable.⁷

The Royal College of Surgeons of England publishes *The Management of Patients with Major Injuries*, which highlights ‘serious deficiencies in the management of seriously injured patients’. The report recommends the management of seriously injured patients in trauma centres and further research into major trauma, including a study into patient outcomes.

1991 The Department of Health provides funding of £2.8 million over three years for a pilot regional trauma centre at North Staffordshire Royal Infirmary.⁸

1992 The NAO publishes *NHS Accident & Emergency Departments in England*. The report concludes that early and continuing improvements are needed to ensure uniformly good provision for care of all severely injured patients, and recommends that the Department should consider how trauma audit should be taken forward.

The first Major Trauma Outcome Study (MTOS) examines the care provided to 14,648 patients in 33 UK hospitals. The study identifies a significantly higher mortality rate for blunt trauma in the UK than in the US.⁹

1997 An evaluation of the pilot regional trauma centre finds that any reductions in mortality from regionalising major trauma care were modest, but recognises that the system had not developed into a comprehensive regionalised system with the right patients being taken to the right hospital at the right time. The evaluation notes that more significant improvements might be achieved with greater integration along the entire trauma care pathway.¹⁰

The British Orthopaedic Association report, *The Care of Severely Injured Patients in the United Kingdom*, concludes that UK patients are not receiving the same quality of care available in countries such as Germany, Switzerland and the US. The report recommends an integrated network approach to treating trauma patients.

2000 The Royal College of Surgeons of England and British Orthopaedic Association publish a joint report, *Better Care for the Severely Injured*, which calls for nationally coordinated standards of care for the severely injured, systematic audit, the development of outcome measures, and the development of trauma teams.

2002 A study by TARN (formerly MTOS) shows a lack of improvement in major trauma care in England and Wales since 1994.¹¹

2004 The NAO publishes *Improving Emergency Care in England*. The report finds that trauma audit has been taken forward through the establishment of TARN, but notes that there was still scope for this work to be developed at a regional level.

2007 The NCEPOD report *Trauma: Who Cares?* identifies deficiencies in both the organisational and clinical aspects of care for trauma patients, and concludes that almost 60 per cent received a standard of care that was less than good practice.

2008 Lord Darzi’s review of the NHS states that there are ‘compelling arguments for saving lives by creating specialised centres for major trauma’. Strategic health authorities are asked to begin considering major trauma services.¹²

2009 National Clinical Director for Trauma Care appointed.

Source: National Audit Office

1.8 In 1992, the NAO report *NHS Accident & Emergency Departments in England*, made a number of recommendations concerning the information and measures required to secure early and continuing improvements in the quality of services for patients with severe injuries (**Figure 6**). Progress against these recommendations is reported in Parts two and three of this report.

Figure 6

The NAO's 1992 recommendations for improving the care of patients with severe injuries

Recommendation

Information needed

Patient numbers, types of injuries, how and when they occur

Quality and availability of pre-hospital care

Provision of experienced medical cover in emergency departments; timing of interventions, seniority of staff carrying out treatments

Availability of essential specialties and support services

Arrangements for patient transfers

Outcomes

Essential measures

Dialogue between the ambulance service and doctors about pre-hospital care

Guidance to ambulance crews on hospitals best able to deal with severely injured patients

Clear advance information to emergency departments on the nature of the injuries to patients

Clear instructions for calling in a trauma team

Advanced life support training for key staff

Evaluation of outcomes, including effectiveness of pre-hospital care

Source: National Audit Office

Part Two

Pre-hospital care

2.1 The majority of people who have suffered major trauma will be taken to an emergency department by an ambulance which has responded to a 999 call.² This part of the report evaluates progress against the NAO's 1992 recommendations for improving pre-hospital care for severely injured patients (**Figure 7**). It examines the effectiveness of the planning and delivery of pre-hospital care for people who have suffered major trauma.

Call assessment, prioritisation and dispatch

2.2 In England, there are 12 trusts responsible for responding to emergency 999 calls, providing on-scene clinical care, and for transporting patients to hospital. During 2008-09, the 12 trusts received 7.48 million urgent and emergency calls, of which 6.15 million resulted in an emergency response arriving at the scene of an incident.¹³ Ambulance trusts do not collect data on the number of incidents of major trauma which they deal with, but our estimate of 20,000 cases each year indicates that major trauma is only a small proportion of the ambulance service's workload.

2.3 Once a 999 call has been put through to an ambulance control room by a telephone operator, an Emergency Medical Dispatcher will prioritise the call by reference to one of three categories of response (category A is the most serious followed by B then C), each of which have an associated response time set by the Department. Call assessment and prioritisation plays an important role in determining whether the ambulance service provides the right response to cases of major trauma.

2.4 There are inevitable limitations to the call prioritisation process as the full extent and seriousness of injuries can be difficult to diagnose remotely, and the information given by the 999 caller may be sparse, incomplete or inaccurate.¹⁴ Our visits to ambulance trusts found that the level of clinical supervision within control rooms varies between trusts, and only one trust routinely audits calls to test whether that they are being appropriately categorised.

Figure 7

Progress against the NAO's 1992 recommendations for improving pre-hospital care for severely injured patients

Recommendation	Progress	
Information needed		
Patient numbers, types of injuries, how and when they occur	Significant data gaps	●
Quality and availability of pre-hospital care	Variable and not standardised	●
Essential measures		
Dialogue between the ambulance service and doctors about pre-hospital care	No formal system	●
Guidance to ambulance crews on hospitals best able to deal with severely injured patients	In some areas bypass protocols exist and some will be operational from April 2010	●
Clear advance information to emergency departments on the nature of the injuries to patients	Commonly in place	●
Evaluation of outcomes, including effectiveness of pre-hospital care	No formal evaluations of the effectiveness of pre-hospital care	●

Source: National Audit Office

2.5 Following call assessment and prioritisation, there are a number of different responses that can be dispatched to the scene. These are determined by established local practices together with factors such as distance to the scene of the incident, time of day, and equipment most immediately available (**Figure 8** overleaf). Most ambulance trusts have access to voluntary providers such as the British Association for Immediate Care (BASICS) or Helicopter Emergency Medical Services (HEMS). Although there is guidance available through the Association of Air Ambulances,¹⁵ we found that there are no NHS guidelines for calling upon HEMS. There are also no NHS guidelines for calling upon BASICS.

Care at scene

2.6 Upon arrival at the scene, the immediate priorities for ambulance service staff in treating trauma patients are airway, cervical spine, breathing, and management of circulation. Depending on the type and severity of injuries suffered, the staff at the scene may also apply specific interventions to rectify identified life-threatening problems.¹⁶ The staff attending the scene will have varying levels of training and experience in the management of trauma patients (**Figure 9** overleaf). In the majority of cases, ambulance service staff attending the scene will be emergency care assistants and paramedics. Staffing of air ambulances varies within and between the different charities, with some opting for a paramedic crew and some a doctor/paramedic partnership.¹⁵

Figure 8

Possible responses to an emergency 999 call attending major trauma

NHS

Emergency ambulances respond to the majority of 999 calls and are staffed by a crew of two. Both staff may be emergency care assistants, or one may be a paramedic. An ambulance is always dispatched to a patient whose reported injuries suggest that they need hospital treatment, but can be diverted to a more serious call if it subsequently becomes clear that the patient can be dealt with by a single responder (see below).

Single response vehicles or fast response vehicles are motorbikes or cars which are usually crewed either by an emergency care assistant, paramedic or doctor. Single responders can often get to the scene more quickly than traditional ambulances, and can provide assessment and care, as necessary, until a further response arrives.

Voluntary Sector

HEMS are provided by 18 air ambulance charities in England, which use 30 helicopters. The onboard medical teams vary with different combinations of paramedics, doctors, ambulance technicians and critical care practitioners. HEMS can be used to get clinical expertise to patients more quickly or to access remote locations. HEMS cannot, however, operate at night or in poor weather, but in some areas helicopters are replaced by ambulance cars at night.

BASICS are a variety of networks of doctors which provide support to the ambulance service at serious road accidents and other trauma incidents. The doctors come from a wide range of specialties and levels of experience working on a voluntary basis. Coverage varies across the country depending on the given number of volunteers and their availability.

Source: National Audit Office

Figure 9

Skills and training of pre-hospital staff in major trauma care

Emergency care assistants

Undertake a six to nine week training course in which they learn moving and handling techniques, first aid, and basic patient skills. Successful trainees work under the guidance of a trained supervisor for a probationary period before working unsupervised.

Paramedics

Must complete an approved full-time course in paramedic science, which includes modules on trauma. Paramedics must also be registered with the Health Professions Council (HPC).

Two NHS trusts have introduced Critical Care Paramedics (CCPs). CCPs are experienced paramedics who have undergone further training enabling them to provide a wider range of care and treatment at the scene for critically ill and injured patients.

BASICS doctors

No uniform approach. The doctors come from a variety of medical backgrounds, skills and experience. For example, a BASICS doctor could be a GP or consultant in emergency medicine.

HEMS doctors

The majority of air ambulance charities employing doctors require them to demonstrate competencies in emergency medicine, with a minimum level of competency at specialist registrar.

Source: National Audit Office

2.7 Unless the patient is bleeding very severely, the most likely cause of death is an insecure airway.¹⁷ In 2007, NCEPOD identified a high incidence of patients arriving at hospital with a partially or completely obstructed airway. There is, however, no clinical consensus concerning the level of airway intervention (intubation) that should be undertaken at the scene, or by whom. A lack of data linked to patient outcomes means there is also currently no clinical consensus on whether it is more beneficial to take the patient immediately to an emergency department, or to remain at the scene and apply additional interventions until the patient is stable.

Transfer from the scene to the emergency department

2.8 Formal triage protocols provide guidance to ambulance staff on the hospital best placed to treat a patient on the basis of their vital signs and level of consciousness, anatomy and mechanism of injury, or risk factors such as age or pregnancy. Our visits to ambulance trusts found that there are currently no formal triage protocols for determining the emergency department to which seriously injured patients should be taken.

2.9 Currently, ambulance staff select the receiving hospital on the basis of location, or on the basis of the perceived severity of the injuries and the level of care they think the patient needs. This means that some patients are taken to hospitals that are not best placed to deliver the treatment the patient requires. Although in some instances there may be a need to divert the patient to a nearer hospital if their airway becomes compromised, taking the patient directly to the hospital best placed to treat them can speed up access to definitive care, reduce the need for inter-hospital transfers, and improve patient outcomes.^{18, 19, 20}

2.10 For the patient to get the best treatment, it is also vital that clear advance information is provided to the receiving emergency department on the nature of the injuries the patient has suffered.^{2, 21} This 'pre-alert' enables the emergency department to prepare for the arrival of the patient, and assemble a trauma team if there is one in place. During our visits, hospitals reported that pre-alerts were received in the majority of cases, with most hospitals having a dedicated telephone line.

Quality and safety in pre-hospital care

2.11 In 2000, national clinical practice guidelines were produced for NHS paramedics, although the principles are applicable to all pre-hospital staff. These guidelines are produced and updated biennially by the Joint Royal Colleges Ambulance Liaison Committee. The guidelines set out consistent standards of care, and all ambulance trusts report that they use them as the basis for their clinical practice standards.¹⁶ On our visits, however, ambulance trusts were unable to demonstrate that there are rigorous processes in place to provide assurance that their paramedics are following the guidelines in practice.

2.12 Ambulance trusts also have choice over the way care is given and the equipment they use to meet the guidelines. Our visits to ambulance trusts found that there are variations in formal treatment protocols and in the equipment carried in ambulances. As a result, there is likely to be variation in the treatment given at the scene of an incident.

2.13 As part of a National Clinical Performance Indicator programme introduced in 2008, five measures of good quality care (clinical performance indicators) have been developed for the ambulance service. These include indicators of quality for cardiac arrest and stroke. A new quality indicator for the care of unconscious trauma was scheduled to be piloted in 2009, but has yet to be agreed.

2.14 Improvements in the quality of care given in the pre-hospital environment are limited by the absence of a link between data on the care given and the outcome for the patient. In addition, there is no systematic collection of data across ambulance trusts for patients who die before reaching hospital and, ultimately, it is the coroner who holds this evidence. This means that unexpected deaths are not identified, and lessons cannot be learned. Our visits to ambulance trusts found that the approach to quality and safety (clinical governance) is not integrated between ambulance trusts, voluntary organisations and hospital trusts.

Part Three

Hospital care

3.1 Upon arrival at the emergency department, life-saving interventions and quick access to appropriate diagnostics, and emergency treatment or surgery are needed. This part of the report evaluates progress against the NAO's 1992 recommendations for improving hospital care for severely injured patients (**Figure 10**). It examines the planning and delivery of emergency and intensive care, including the effectiveness of arrangements for transferring patients to specialist and rehabilitative care.

Figure 10

Progress against the NAO's 1992 recommendations for improving hospital care for severely injured patients

Recommendation	Progress	
Information needed		
Provision of experienced medical cover in emergency departments; timing of interventions, seniority of staff carrying out treatments	Variable and not standardised	●
Availability of essential specialties and support services	Variable and systems not formalised for transfer	●
Arrangements for patient transfers	No formal systems in place	●
Outcomes	Mortality is measured, but there are no measures of morbidity or disability	●
Essential measures		
Clear advance information to emergency departments on the nature of the injuries to patients	Commonly in place	●
Clear instructions for calling in a trauma team	Most ambulance trusts have protocols for pre-alerting for major trauma, and this is used by the hospitals as guidance for calling in a trauma team where they exist	●
Advanced life support training for key staff	No formal system for ensuring that key staff have received advanced life support training, but many staff involved in trauma will have received this training	●
Evaluation of outcomes	Not done routinely	●

Source: National Audit Office

Arrival at the emergency department

3.2 In England, 193 hospitals have accident and emergency departments that provide treatment for people who have suffered major trauma. On the basis of cases submitted to TARN, there is significant variation in the number of cases of major trauma individual hospitals treat each year, ranging from 18 to 265 per hospital depending on hospital size, location and local demography.²² Major trauma is, however, a minor element of emergency department work, equating to less than 0.2 per cent of total activity.

3.3 In 2000, the Royal College of Surgeons of England recommended that all hospitals receiving major trauma should establish trauma teams who are available at all times. The 2007 NCEPOD report found, however, that trauma teams had not been established in around 22 per cent of hospitals receiving trauma. Our hospital visits identified that this may be due to the low incidence of major trauma in some areas. However, this raises an issue about whether such hospitals should either create teams or downgrade themselves, with major trauma patients being treated by only those with dedicated teams.

3.4 The composition of trauma teams varies between hospitals according to staffing resources and the time of day, but teams will generally have six to ten members and consist of representatives from the emergency department, anaesthesia, nursing, radiography, and relevant surgical disciplines (as determined by the patient's reported injuries). The activation of the trauma team takes place following a 'pre-alert' from the ambulance service and before the patient arrives at the emergency department.

3.5 The Royal College of Surgeons of England also recommended that trauma teams should be consultant-led.²¹ The NCEPOD report found, however, that this happened in only 40 per cent of cases, with 42 per cent of trauma patients not seen by a consultant from any specialty whilst in the emergency department. The NCEPOD report also found that clinically inappropriate responses were more common when the patient was not first seen by a consultant. For example, the research showed that when patient notes were reviewed against trauma standards, consultants responded appropriately in 96.9 per cent of cases but junior doctors did so in only 76.5 per cent of cases (**Figure 11**).

Figure 11
Appropriateness of initial hospital response by grade of first reviewer

Seniority of first reviewer	Appropriate response		Inappropriate response		Total
	Number	Percentage	Number	Percentage	
Consultant	154	96.9	5	3.1	159
Non-consultant career grade	16	84.2	3	15.8	19
Specialist registrar doctor	204	88.3	27	11.7	231
Junior doctor	52	76.5	16	23.5	68
Total	426		51		477

Source: *The National Confidential Enquiry into Patient Outcome and Death (2007). Trauma: Who cares?*

3.6 Our survey of hospitals found that consultants were most likely to be present in the emergency department between 8am and 8pm on weekdays, and on call at nights and weekends. Only one hospital has 24-hour consultant presence seven days a week. The NCEPOD report found that people are most likely to suffer major trauma at night and at weekends (Figure 4). As a result, around 40 per cent of patients were first seen by a consultant between 08:00 and 17:59, compared to 28 per cent between 18:00 and 23:59 and 12 per cent between 00:00 and 07:59.

3.7 Following handover from the ambulance service, the receiving hospital will carry out a primary survey of the patient, the aim of which is to identify and seek to address any immediately life-threatening conditions.¹⁷ This assessment is usually informed by a Computed Tomography (CT) scan, which provides rapid and detailed information on injuries and the site of any internal bleeding. The use of CT scanning in patients with major trauma can quickly reveal unsuspected injuries, reducing the need for additional investigations and decreasing the time to definitive care.² TARN data show, however, that a significant number of patients who need a CT scan do not receive one (Figure 12).

3.8 NICE guidelines state that the time taken to have a CT scan following a suspected serious head injury should be less than one hour after arrival at the emergency department.²³ The median time taken for a CT scan for a serious brain injury is, however, around 1.5 hours, and 25 per cent of patients with a head injury have to wait in excess of two hours (Figure 13 overleaf). The NCEPOD report identified that availability of 24-hour access to CT scanners is good, but CT scanners are sometimes not located adjacent to the emergency department which is not optimal.

Figure 12
Access to CT scan

Injury severity score	Number of patients	Needed CT	Needed CT and had CT
16-25	2,435	2,111	1,622/2,111 (76.8%)
26-40	1,080	1,056	858/1,056 (81.3%)
41-74	315	315	220/315 (69.8%)
75	40	32	9/32 (28.1%)
All major trauma	3,870	3,514	2,709/3,514 (77.1%)

Source: Trauma and Audit Research Network (2009). *Modelling Trauma Workload: A Project for the Department of Health*.

NOTES

- 1 These data include patients injured between 2003 and 2007.
- 2 People with higher injury severity scores may have not received a CT scan before they died from their injuries. This may be as a result of a clinical judgement based on the severity of the trauma.

Figure 13

Time taken to CT scan for patients with a serious brain injury

Abbreviated injury scale score	Median time to CT	Time to CT (25th percentile/75th percentile)	Died within 2 hours of arrival & needed CT (%)
5+	1 hour 24 minutes	47 minutes/2 hours 7 minutes	4.4
4+	1 hour 30 minutes	49 minutes/2 hours 15 minutes	3.2
3+	1 hour 30 minutes	49 minutes/2 hours 16 minutes	3.5
No brain injury	2 hours 18 minutes	1 hour 7 minutes/2 hours 57 minutes	3.9

Source: Trauma and Audit Research Network (2009). *Modelling Trauma Workload: A Project for the Department of Health.*

NOTES

- 1 These data include patients injured between 2003 and 2007.
- 2 Hours to CT scan is presented as an inter-quartile range i.e. the lowest and highest 25 per cent of times.
- 3 The abbreviated injury scale is an anatomical scoring system that classifies individual injuries on a six point scale, ranging from 1 (minor) to 6 (untreatable). Injuries scored at 3 and above are defined as serious.

Surgery

3.9 Major trauma patients often have multiple injuries and need to be treated by different surgical specialties. Whilst general and orthopaedic surgeons are commonly available on-site, this is not the case for specialties such as neurosurgery, vascular, cardiac and thoracic surgery. The availability of specialties also decreases significantly out of hours, and only 17 of the 183 hospitals for which there are data in the NCEPOD report have 24-hour access to all of the specialties most commonly required to treat major trauma patients.

3.10 Alongside access to relevant surgical disciplines, coordination of care is essential. Our hospital visits found that in hospitals with dedicated trauma consultants and trauma wards, the patient's needs can be prioritised by doctors and nurses who are experienced in managing multiple injuries. In other hospitals, surgery is less coordinated, which may lead to unnecessary delays.

3.11 In addition to wasted bed days, delays to surgery lead to poorer outcomes. For example, delayed surgery of fractures of the pelvic hip socket can lead to osteoarthritis, hip damage and the need for artificial joint replacement. Research shows that with prompt surgery, within five to seven days, 80 per cent of patients with the most complex fractures can recover with good results, avoiding disability. However, less than 50 per cent can expect the same results after 10 days and almost no one after three weeks. Yet the British Orthopaedic Association reports that the average delay for such surgery is between 10 and 20 days.²⁴

Transfers

3.12 There is a need to transfer some patients to hospitals that can provide more complete or more specialist care. For example, an examination of mortality for patients with head injuries between 1989 and 2003 based on TARN data showed that treatment for head injuries in non-neurosurgical centres was linked with a 26 per cent increase in mortality and a 2.15 fold increase in the odds of death when compared with patients treated in a neurosurgical centre.²⁵ TARN data show, however, that over 60 per cent of all patients who needed a transfer to get specialist treatment were not transferred (**Figure 14**). Reasons for this vary and can be due to the condition of the patient, but in other cases is due to a lack of capacity or a formal system through which to arrange the transfer.

3.13 With no formal transfer system in place, hospitals with specialist facilities are under no obligation to accept transfers from other hospitals. In practice, transfers often rely upon ad hoc informal arrangements built up over time and, during our hospital visits, consultants reported that telephone calls to colleagues in other hospitals are the usual arrangement to find one able to accept the transfer. This process involves sending scans and patient information electronically and waiting for a clinician, who may not be available, to make the decision to accept a patient.

3.14 The current Payment by Results regime, under which hospitals receive much of their funding, represents a potential barrier to the efficient transfer of patients because it is not sophisticated enough currently to fully identify the cases of major trauma and thus provide associated funding. This means that some hospital trusts are not incentivised to accept the most complex cases.

Figure 14
Patient transfers

Injury severity score	Number of patients	Needed specialist input	Needed transfer for specialist input	Needed specialist input and were transferred
16-25	3,495	3,393	2,026	779/2,026 (38.5%)
26-40	1,572	1,563	1,071	381/1,071 (35.6%)
41-74	431	430	360	85/360 (23.6%)
75	46	38	29	2/29 (6.9%)
All major trauma	5,544	5,424	3,486	1,247/3,486 (35.7%)

Source: Trauma and Audit Research Network (2009). *Modelling Trauma Workload: A Project for the Department of Health*.

NOTE

These data include patients injured between 2003 and 2007.

Critical care

3.15 Following major trauma, most patients have a stay within intensive or critical care. The median length of stay being ten days for an injury severity score of between 16 and 25, increasing to 23 days for patients with an injury severity score of between 41 to 74. However, patients do not always receive the care they need. TARN data show that 82 per cent of patients with a severity score of between 16 and 25 needed critical care, but only 45 per cent were placed in a critical care bed (**Figure 15**).

3.16 The number of critical care beds in England has increased from 2,343 beds in 2000 to 3,647 in 2009, but during our visits hospital trusts reported that critical care capacity remained an issue which they managed only by transferring and moving patients within the hospital. This is supported by data from the Intensive Care National Audit & Research Centre (ICNARC), which indicates that around a third of critical care moves for trauma patients are carried out for non-clinical reasons.²⁶

Rehabilitation

3.17 Rehabilitation is an essential part of care for people who have suffered major trauma, and aims to optimise the restoration of physical, psychological and social functions and reduce secondary complications.¹⁷ During our visits to hospitals and strategic health authorities, a lack of capacity in rehabilitation services for major trauma was commonly highlighted. This leads to patients with complex injuries remaining unnecessarily on general acute wards, and being cared for by staff without the specialist skills required to appropriately manage them. It also leads to delays to treatment which may impact on recovery, and reduce bed availability for elective surgery. There is, however, a scarcity of evidence upon which to effectively plan rehabilitation services.²⁷

Figure 15

Access to critical care

Injury severity score	Number of patients	Needed critical care (%)	Went to critical care (%)	Median length of stay in critical care (days)	Median length of stay (days)	Median length of stay – survivors only (days)
16-25	3,495	82	45	3	9	10
26-40	1,572	98	61	5	11	15
41-74	431	99	64	7	6	23
75	46	87	23	5	1	16

Source: Trauma and Audit Research Network (2009). *Modelling Trauma Workload: A Project for the Department of Health*

NOTE

These data include patients injured between 2003 and 2007.

3.18 Guidelines on rehabilitation after critical illness were published by NICE in March 2009. The guidelines identified that rehabilitation strategies may help to reduce a patient's length of stay in hospital, minimise hospital readmission rates, and reduce the use of primary care resources. A number of studies have also shown that identifying rehabilitation needs early and starting rehabilitation early can lead to earlier discharge from critical care.²⁸

3.19 NICE has identified that not all critical care patients are rehabilitated early and rehabilitation strategies after a critical illness are not routinely prepared for a patient, particularly after hospital discharge. The availability of rehabilitation services also varies widely across the country and currently lacks coordination.²⁸ This variation may reflect the fact that existing services have developed on the basis of local geography and expertise, and that the actual needs of different groups of patients have not been systematically appraised.²⁹ Pressures on beds or a lack of rehabilitation services can also mean that some patients may be sent home inappropriately.

Quality and safety in hospital care

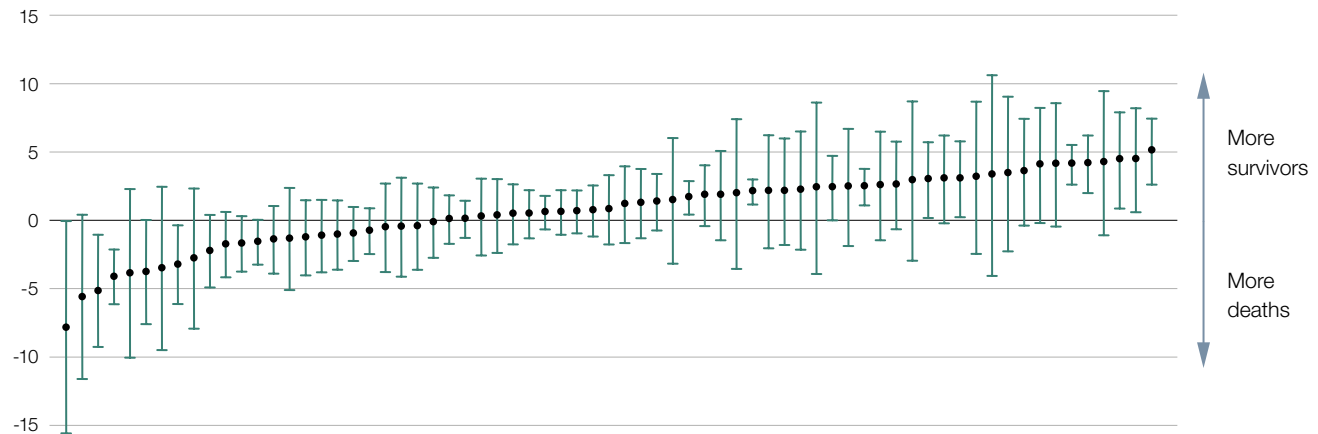
3.20 The principal means for hospitals to gain assurance over the quality of care for people who have suffered major trauma is by monitoring patient outcomes. Hospitals currently take a number of approaches, including mortality and morbidity meetings where individual cases are reviewed by clinicians; wider case reviews that include a range of staff involved in trauma care; and trauma committees which are part of the quality and safety (clinical governance) structure of the hospital.

3.21 Across England, 59 per cent of the 193 hospitals which treat major trauma voluntarily submit data to TARN for analysis and comparison with other hospitals. These data show that, in England, there are some hospitals that save more lives than expected, whilst in others there are more deaths than expected, ranging from between 5.12 unexpected survivors and 7.72 unexpected deaths per 100 trauma patients (**Figure 16** overleaf).

3.22 These data must be treated with some caution since not all hospitals submit data to TARN and only 36 hospitals submit data at the level expected based on activity; although this number is increasing. The variability of data quality reflects the fact that some hospitals have provided more resources than others for collecting data. For example, our survey showed that some hospitals employ at least one member of staff to input their data, whereas others use a member of staff to carry out the task alongside other work. The results are nonetheless sufficiently reliable to raise serious issues about the variation in outcomes between hospitals.

Figure 16

Observed versus expected number of survivors per 100 trauma cases per hospital between 2005 and 2008

Unexpected survivors or unexpected deaths per 100 trauma cases

Source: Trauma and Audit Research Network

NOTES

- 1 These data include patients injured between 2005 and 2008.
- 2 The dots represent the observed versus expected number of survivors per 100 trauma patients for individual hospitals. The bars represent a 95 per cent confidence interval.

3.23 Our survey of TARN-contributing hospital trusts found that the most common reason for contributing was to benchmark performance and to identify areas for improvements (**Figure 17**). Hospitals responding to our survey reported that TARN data are commonly reviewed by trauma clinicians (80 per cent) or clinical governance/audit staff (70 per cent), but are less frequently reviewed by trauma committees (52 per cent), or trust boards (48 per cent). However, only 16 per cent of hospitals contributing to TARN reported that they contacted other hospitals with better scores to learn from their procedures.

3.24 We also surveyed hospitals that deal with major trauma but do not contribute to TARN to establish their reasons for not doing so. The most common reasons were the cost of subscribing to the service (TARN is funded by participating hospitals who subscribe at a cost of between £3,700 and £5,800 per annum), and the cost of employing someone to collect the necessary data. Only 30 per cent of these hospitals reported that they collect their own data to assess their performance in treating major trauma. Reasons for not doing so included their views that they received too few patients; that the effort exceeded the benefits; and trauma not being seen as a priority.

3.25 Measurement of outcomes for major trauma is almost exclusively focused on mortality during the initial period of hospitalisation. There are no agreed measures for assessing disability or morbidity and beyond that the physical, social, and psychological impact of major trauma on those that survive is not monitored.

Figure 17

Examples of the use of TARN data

Dorset County Hospital

Analysis of TARN data showed that a significant proportion of major trauma cases presented between midnight and 8am, thereby identifying the need for resident experienced staff during this time period.

Leeds General Infirmary

TARN data are used to monitor progress against the recommendations in the 2007 NCEPOD report.

Royal Derby Hospital

TARN data are used to plan local services relating to management of patients with head injuries.

Ipswich Hospital NHS Trust

TARN data are used to inform the development of local guidelines for the management of spinal trauma, blunt abdominal trauma, open fractures, peripheral vascular injuries, and chest injuries.

Source: National Audit Office survey of TARN-contributing hospitals

Part Four

Providing more effective major trauma care

4.1 In 2008, Lord Darzi, as part of his review of the NHS, asked SHAs to develop regional plans for the provision of major trauma services. He considered that there were ‘compelling arguments for saving lives by creating specialised centres for major trauma’.¹² This part of the report examines the plans that are in place to improve trauma care in England, and what progress has been made.

The rationale for trauma networks

4.2 In 2000, the Royal College of Surgeons of England recommended that within each geographical region there should be a network of units to treat trauma patients with life-threatening conditions. A trauma system of this type integrates care at the scene, the initial journey to a suitable unit, inter-hospital transfer (where required for patients in need of more specialist treatment), definitive hospital treatment, and rehabilitation. The Royal College’s report recommended each region should have a major trauma plan defining the pathway of care for severely injured patients, identifying the location and capability of each hospital within the trauma system, and outlining ambulance bypass protocols and thresholds for transferring patients to more specialist units.²¹

4.3 Analysis of the published literature on major trauma suggests that in areas of the world where major trauma systems have been introduced, in-hospital mortality reduces by 15 to 20 per cent.^{19, 20} On the basis of our estimate of 3,000 deaths in hospital^b from major trauma each year, this would suggest that an additional 450 to 600 lives could be saved each year across England. Monitoring of outcomes for major trauma patients following the introduction of the Victorian State Trauma System in Australia also suggests that introduction of a trauma system can reduce length of stay in hospital and increase the number of people living independently at six months post-injury.³⁰

4.4 International research shows that for a hospital to develop and maintain optimal skills in major trauma it would need to see 650 cases per year.³¹ It is, however, unlikely that any hospitals in England will see this many major trauma patients in a year and therefore the focus needs to be on integrated services between hospitals.

^b Studies assessing trauma system efficacy rely on hospital deaths as the primary indicator of effectiveness. As a result, the potential impact of trauma system implementation on the number of deaths that occur before arrival at hospital cannot be quantified.

The Department's Regional Trauma Networks Programme

4.5 On 1 April 2009, the Department appointed a National Clinical Director for Trauma Care to provide national leadership for the implementation of regional trauma networks in England. The resulting programme, through the development of clinical advisory groups, is investigating the evidence, national and international guidance, and research required to assist SHAs in the successful execution of such networks.

4.6 Other areas of work that the National Clinical Director for Trauma Care will examine include the contribution of commissioning, audit, modelling, metrics, standards, critical care capacity, interventional radiology, rehabilitation, behavioural change, workforce, and training needs to improving outcomes for patients who have suffered major trauma.

Current progress in reforming trauma care

4.7 There is significant variation in approach and progress by SHAs in developing regional plans for major trauma care, ranging from detailed modelling to very little progress at all (**Figure 18** overleaf). In considering their arrangements, SHAs have also largely focused their plans on hospitals and primary care trusts within their administrative boundaries and, as yet, plans between bordering regions have been limited. Rehabilitation has also not been fully considered in these initial reviews, and NHS London specifically scoped rehabilitation out of the initial stage of its project.

4.8 Two SHAs (London and East Midlands) have taken a number of steps towards the implementation of regional trauma networks, including consulting the public on their plans. The two SHAs' plans focus on having three types of hospital. At the heart of the system would be major trauma centres equipped to receive and care for the majority of major trauma patients. At the next level would come trauma units which provide limited and selected trauma care. At a third level, local hospitals would continue to provide existing emergency department services to people with minor injuries but would not expect to see those with serious injuries. It is envisaged that the network will be responsible for determining where a patient will be taken, and for arranging any subsequent onward transfers for specialist care.

4.9 The level of data upon which to effectively review trauma services varies between SHAs, as shown by the varying proportion of hospitals submitting data to TARN in Figure 18. Decisions about designating hospitals as suitable to receive major trauma patients are therefore being made based on facts such as current facilities, expertise and capacity, supported by modelling of the incidence of major trauma, and travel and transfer times for major trauma patients. The number of hospitals per region is being considered based on expected numbers of major trauma patients per year.

Figure 18

Progress on reforming major trauma care in England by SHA area

North West

Trauma care is being reviewed. Data are submitted to TARN by 85 per cent of hospitals with an emergency department.

West Midlands

Trauma care reviewed and changes under consultation for three major trauma centres. Data are submitted to TARN by 43 per cent of hospitals with an emergency department.

South West

Trauma care is being reviewed and it is likely that two major trauma centres will be proposed, supported by links to two further centres outside of the South West. Data are submitted to TARN by 42 per cent of hospitals with an emergency department.

South Central

Trauma care is being reviewed. Data are submitted to TARN by 58 per cent of hospitals with an emergency department.

South East Coast

Trauma care is being reviewed. Data are submitted to TARN by 50 per cent of hospitals with an emergency department.

North East

Trauma care reviewed and no changes have been proposed. An informal trauma network is in operation. Data are submitted to TARN by 73 per cent of hospitals with an emergency department.

Yorkshire and Humber

Trauma care is being reviewed. Data are submitted to TARN by 45 per cent of hospitals with an emergency department.

East Midlands

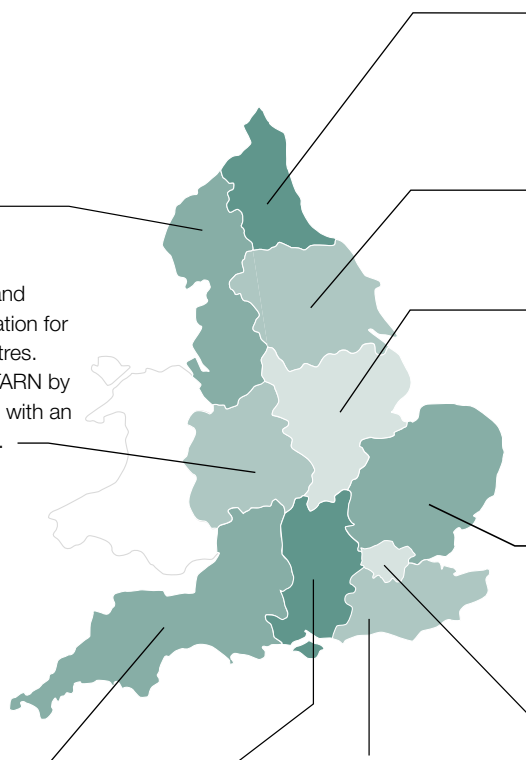
Trauma care reviewed, including detailed modelling. One major trauma centre has been proposed, supported by a number of trauma units. Plans on how the network will operate are being developed. Data are submitted to TARN by 80 per cent of hospitals with an emergency department.

East of England

Trauma care reviewed and two hospitals have been identified as possible major trauma centres. Data are submitted to TARN by 56 per cent of hospitals with an emergency department.

London

Trauma care networks developed and will commence in April 2010. Four major trauma centres have been announced with bypass protocols in place and plans for how the network will operate. Data are submitted to TARN by 58 per cent of hospitals with an emergency department.



Source: National Audit Office

An example of a trauma system – London trauma networks

4.10 The most developed trauma plans have been made by the London SHA (Healthcare for London). Following consultation with the 31 London PCTs and the public, Healthcare for London plans to implement a trauma system which comprises four networks from April 2010. Major trauma centres will be located at: The Royal London Hospital (Whitechapel), St George's Hospital (Tooting), King's College Hospital (Denmark Hill) and St Mary's Hospital (Paddington). Whilst other SHAs will be able to learn from the development of the London networks, the system cannot be directly replicated in other areas of England due to variations in population size and density. Other pathways will need to be agreed in these areas.

4.11 The Royal London, which is already close to operating as a major trauma centre, will take a leading role in establishing London's trauma system. A London Trauma Director was appointed in September 2009 to lead the system. Healthcare for London has modelled that each major trauma centre should be within 45 minutes reach by emergency vehicle from anywhere within the Greater London area (the area shown in grey in **Figure 19**). A triage protocol has been agreed with the London Ambulance Service to support decisions regarding which patients should be taken to the major trauma centres on the basis of an assessment of vital signs and consciousness, anatomy of injury, mechanism of injury, and individual patient factors (e.g. age, pregnancy, obesity), and which should be taken to trauma units.

Figure 19

London trauma networks



4.12 Healthcare for London plans to coordinate and monitor the performance of the trauma system through the establishment of the London Trauma Office, which will be responsible for coordinating the performance management of the system and for quality improvement. Submission of TARN data will be a prerequisite for major trauma centres and trauma units, with subscription and collection of data mandatory before the system goes live. The network and major trauma centres will be commissioned by the London Specialised Commissioning Group, whilst the trauma units will be commissioned locally by primary care trusts.

Funding and incentives for major trauma networks

4.13 Payment by Results (PbR) aims to provide a transparent system for paying trusts for patient care. During our visits, trusts suggested that the income from PbR would not cover costs if treating high volumes of patients with complex needs. For example, one trust we visited had evaluated the costs of treating major trauma in detail and, where injury severity scores were 16 or greater, the hospital income per patient was 10 to 15 per cent lower than its estimated costs. This imbalance does not provide the right incentive for hospitals to extend major trauma services. The Department is now reviewing these financial levers.

Appendix One

Methodology

The main elements of our fieldwork took place between May and September 2009.

Method	Purpose
Review of key policy documents, standards of care, and academic literature.	To develop our understanding of the development of major trauma care; identify standards of care; and to identify data sources for triangulation with data collected from TARN and on our visits.
Census of hospitals with an emergency department that do not submit data to TARN and a survey of hospital trusts that do.	To establish why hospitals do not submit data to TARN, and what benefits arise for those that do. We also requested information on consultant presence in emergency departments.
Semi-structured interviews with key stakeholders, including the Department of Health, NCEPOD, TARN, and the Royal College of Surgeons.	Qualitative analysis of themes to identify issues with major trauma care and to triangulate with quantitative data.
Visits to 10 ambulance trusts and nine hospital trusts.	To gain an understanding of the local arrangements and challenges for the regionalisation of services for major trauma.
Telephone interviews and visits with strategic health authorities.	To gain an understanding of the existing delivery of major trauma care within SHA areas, and any plans for reorganisation.
Analysis of data from TARN.	To develop a national picture of the quality of major trauma care (including performance against relevant standards), and to identify the extent of any variation in the care provided.
Discussions with patient representative groups, such as Headway.	To gain an understanding of the patient experience following major trauma.
Economic analysis/modelling of costs.	To estimate the cost of treating major trauma, and the value of lost economic output associated with death and the injuries sustained.

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Design and Production by
NAO Marketing & Communications Team
DP Ref: 009203-001

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