The management of trauma victims in England and Wales: a study by the National Confidential Enquiry into Patient Outcome and Death

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Received 8 August 2008; received in revised form 19 March 2009; accepted 24 March 2009; Available online 14 May 2009

Abstract

Objective: Trauma is the leading cause of death in the first four decades of life in western countries. A national prospective study was conducted in the UK to examine the process and quality of care of severely injured patients. We present a previously unpublished analysis of the severity of injury, place of treatment, quality of care and survival amongst patients with thoracic injuries. Methods: All UK hospitals with an emergency department were asked to provide prespecified clinical and process data on all patients presenting with significant injuries between 1st February and 30th April 2006. All data were stripped of patient, clinician and institutional identifiers before review by expert advisors. Results: Data adequate for analysis were obtained on 1735 of 2203 injured patients reported. An injury severity score (ISS) ≥ 16, the threshold for severe injury, was derived from case records of 795 patients, who comprise the study denominator. Of these, 387 (49%) had a thoracic injury, usually as part of polytrauma. The mortality rate was 8% (of 13) 9% (of 23) 10% (of 175) 14% (of 136) 22% (of 37) and 100% (of 3) for the six ascending grades of severity for the thoracic component of the ISS score. One hundred and seventy-six of the 795 patients (22%) had a thoracic injury sufficient for them to be classified as severely injured regardless of any other injuries. The quality of care as assessed by expert advisors showed an apparent association with overall trauma volume of the 142 treating hospitals. For patients with thoracic injuries where the specialty of the team in charge could be identified (n = 284/387) trauma and orthopaedics (T and O) cared for 36%, critical medicine 22%, general surgery 19%, neurosurgery 8% and only 5% were in the care of thoracic surgeons. One or more chest drains were inserted in 203/795 (26%) of patients, few of them by thoracic surgeons. Conclusions: Given that polytrauma patients rarely come under the care of thoracic surgeons and yet frequently have severe thoracic injuries there is a clear need for T and O surgeons and generalists to have a good grounding in thoracic procedures.

Keywords: Trauma; Lung injury; Chest drains

1. Introduction

Trauma is the leading cause of death in the first four decades of life in the UK. The incidence of severe trauma, defined as an injury severity score (ISS) of 16 or greater (Tables 1 and 2) is estimated to be four per million per week [1]. For every death there are two survivors with serious or permanent disability so trauma is also a major cause of long-term morbidity. The chance of survival and the completeness of recovery are highly dependent on the care that follows the injuries; some patients are killed outright but those who survive the initial event may still die in the hours, days or weeks that follow. It follows that trauma is also a large socio-economic burden.

In 2000, a joint report from the Royal College of Surgeons of England and the British Orthopaedic Association recommended that standards of care for the severely injured patient should be nationally coordinated and systematically audited. Recommendations included minimising delay at the scene and that ambulance crews should alert hospitals of severely injured patients and of their injuries.

An average district hospital is unlikely to treat more than one severely injured patient weekly and as sufficient trauma

§§ This work was undertaken by NCEPOD, which received funding for this report from the National Patient Safety Agency. The views expressed in this publication are those of the authors and not necessarily those of the Agency.  
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1 http://www.ncepod.org.uk/contact.htm.  
2 http://www.ucl.ac.uk/operational-research/.  
4 Better Care of the Severely Injured. Royal College of Surgeons 2000; Available from: URL: http://www.rcseng.ac.uk/rcseng/content/publications/docs/severely_injured.html.
experience cannot be achieved at all hospitals, optimal outcomes may be compromised. In 2006, the UK National Confidential Enquiry into Patient Outcome and Death (NCEPOD) conducted a study to identify remediable features in the organisation and delivery of care for severely injured patients. An injury to the chest is often a component of polytrauma but, with timely and appropriate management, may be a recoverable component. NCEPOD’s prospective study revealed findings pertaining to the management of thoracic injuries in a defined series of severely and often multiply injured patients.

2. Methods

Patients were identified prospectively from February 1st 2006 to April 30th 2006 from all hospitals accepting emergencies in England, Wales and the Channel Islands. A nominated contact in the emergency department identified all patients who were judged clinically to be ‘severely injured’. A list of such patients (which included a patient identifier and the date and time of admission) was then forwarded to a designated individual within that hospital (the NCEPOD local reporter). The local reporter submitted monthly data to NCEPOD. The data comprised details of the admitting clinician, photocopies of any documentation completed by ambulance crews at the scene of injury and on the journey to hospital, and the case notes covering the first 72 h in hospital. Based on the case notes, the staff at NCEPOD calculated an injury severity score (ISS) for each patient (Tables 1 and 2). Patients with an ISS of 16 or more were included in the study.

For patients included in the study, the case notes were used to inform expert peer review of the cases. Additional information was requested from the admitting clinician and from the clinician responsible for the initial treatment of the patient within the accident and emergency department.

Peer review of each case was conducted by a multi-disciplinary group of advisors comprised of clinicians from the following specialties: emergency medicine, anaesthesiology, general surgery, intensive care medicine, maxillofacial surgery, neurosurgery, nursing, paediatrics, plastics, orthopaedics and vascular surgery. For each case reviewed, the advisor completed an assessment form, highlighting any concerns, and graded the overall care.

3. Data analysis

After checking the data for face validity, a series of descriptive statistical summaries were produced using Microsoft Access and Excel. No formal hypothesis tests were planned or conducted.

We categorised the patients included in the study according to the severity of any thoracic injury that they had. We then constructed tables to display the severity of non-thoracic injuries, the site of the thoracic injury and the use of chest drains among these groups.

A table was constructed to display the specialty of the admitting clinicians for these patients and the use of chest drains.

In order to identify a sample of patients where the care received in relation to their thoracic injury might be considered to have had a significant bearing on the overall quality of care received by the patient, we selected for further analysis those patients with a thoracic injury graded as severe, critical or unsurvivable (grades 4–6 of the 1–6 AIS scale).

Hospitals were categorised as comparatively high, medium and low volume institutions defined by tercile of all trauma patients included in our study. The advisors’ opinions as to the overall quality of care received were displayed according to these groups.

4. Results

A total of 795 patients met the criteria for inclusion in the study. Table 3 shows the number of patients with each possible combination of the severity of their worst thoracic injury and the severity of their worst non-thoracic injury. Note that the empty cells denote combinations of injury severity that would not warrant inclusion in this study. Outcomes for all patients are included in the NCEPOD report. In 408 patients there was no thoracic injury and they are excluded from the analysis that follows leaving 387 for

Table 1
Acute Injury severity (AIS) scoring system. Descriptions of the severity of each injury are converted to numerical scores 1—6.

<table>
<thead>
<tr>
<th>AIS score</th>
<th>Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minor</td>
</tr>
<tr>
<td>2</td>
<td>Moderate</td>
</tr>
<tr>
<td>3</td>
<td>Serious</td>
</tr>
<tr>
<td>4</td>
<td>Severe</td>
</tr>
<tr>
<td>5</td>
<td>Critical</td>
</tr>
<tr>
<td>6</td>
<td>Unsurvivable</td>
</tr>
</tbody>
</table>

Table 2
Scores are allocated in six body areas in the first column. Examples of injuries and the score that would be allocated are given in the second and third columns. For the three most severely injured areas the scores are squared and summed to give a final score in the fourth column. Scores above 16 define the severity of any thoracic injury that they had. We then constructed tables to display the severity of non-thoracic injuries, the site of the thoracic injury and the use of chest drains among these groups.

<table>
<thead>
<tr>
<th>Region</th>
<th>Injury description (examples)</th>
<th>AIS</th>
<th>Square top three</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head and neck</td>
<td>Cerebral contusion</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Face</td>
<td>No injury</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Chest</td>
<td>Flail chest</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Abdomen</td>
<td>Minor contusion of liver</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Extremity</td>
<td>Fractured femur</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>External</td>
<td>No injury</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Injury severity score</td>
<td></td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>


further more detailed consideration. There were 291 males (75%) and 96 females. Their age distribution is given in Fig. 1.

The death rate escalated in line with the severity of the thoracic injury being 8%, 10% and 16% for increasing severely injury groups in Table 3 and 100% for the three patients with injuries deemed unsurvivable.

The site of the most major component of the chest injury is shown in Table 4. Many of these patients will have had a combination of lung, rib cage and other injuries but for clarity we have used the most severe element of the thoracic injuries to present an overall picture of the nature and relative distribution of injuries in this patient group. It can be seen that the picture is dominated by rib cage and lung injuries.

In patients in whom a thoracic injury was a component of the injury, 52% were recorded in the notes as having a chest drain inserted (Table 5). For two patients (both in severe to critical category) the advisors specifically noted that a chest drain(s) should have been inserted but there was no record that this was done. For nine patients who had chest drains inserted (four in the serious and five in the severe to critical categories) advisors highlighted issues about the chest drains. Seven were related to delays in insertion.

The system in the UK usually provides for the patient to be taken to a hospital with the level of resuscitation, operating theatres and intensive care facilities to care appropriately for most patients. As a result admission is usually under trauma and orthopaedics or general surgery with a proportion of patients admitted to intensive care as indicated by the designation critical care medicine (Table 6). Among the 176 patients with the more severe thoracic injuries, it was infrequent for patients to be admitted initially under the care of a thoracic or cardiothoracic surgeon (12/176).

The NCEPOD advisors’ grading of the quality of care received by these selected patients is shown in Table 7. To
create a measure of institutional volume the admitting hospitals were grouped in terciles according to the number of all trauma patients included in the study, the bands being chosen to form three similarly sized groups. The advisors judged there to be room for improvement (either clinical, organisational or both) in a substantial proportion of cases. The proportion of patients deemed to have received care consistent with good practice was highest for patients admitted to higher volume centres.

5. Discussion

This was a prospective study and all evaluations were made on a full exploration of the case notes and of the reports of the clinicians involved in care. These records were anonymised prior to assessment by the group of advisors, not only for patient details but also the identity of the hospital and the personnel. We believe that this excludes assessor bias to a large extent and so far as it is possible to do. We believe that the data and assessments are objective.

Nevertheless, there may be incompleteness of the data available to the assessors. Of particular relevance here is the finding that in only 52% of these 387 patients with a thoracic injury was there evidence that a chest drain had been inserted. Even in the more severe categories there was lower use of chest drains than expected. Even if this finding were solely due to clinicians omitting to document the insertion of a chest drain, that is serious enough; from a medicolegal viewpoint, unless a procedure is recorded it may be assumed not to have been done.

However, it is likely that the finding is genuine. The expert advisors look at all the notes and other later references to drainage or drain position would have been picked up so it is our assessment that this truly reflects a worrying under usage of this simple means of managing chest complications. Given the critical nature of these patients, that hypoxaemia is a major contribution to the development of multiple organ failure, and that some will need intubation and positive pressure ventilation, this is a worrying finding. It is important to state that we cannot conclude with any confidence that the outcome in any individual case was materially influenced by the use of a well-sited and well-managed chest drain will help stabilise the thoracic component of poly trauma. Specialist thoracic and cardiothoracic surgeons are well aware of their potential role in teaching this basic skill. It should be noted that all elective thoracic surgery is performed by thoracic or cardiothoracic surgeons, other than some general surgeons who perform oesophageal surgery and others working on thoraco-abdominal aortic aneurysms. In the UK, we do not have a body of general surgeons with a thoracic interest.

In the full report we point to the lack of appreciation of severity of illness, of the urgency of the clinical scenario and incorrect clinical decision-making that were apparent. Many of these clinical issues were related to the lack of seniority and experience of the staff involved in the immediate management of these patients. It was clear that the provision of suitably experienced staff during evenings and nights was much lower than at other times. In the management of trauma, which very often presents at night, this is a major concern.

Severe trauma is not common in Britain and many hospitals see less than one severely injured patient per week. This has a direct bearing on experience and ability to manage these challenging patients. Not only does this relate to clinical skills but also to the feasibility of providing the entire infrastructure required to manage the trauma patient definitively in all centres. We continue to place emphasis on getting patients to a well-equipped and appropriately staffed hospital as expeditiously as possible once the immediate safety steps are taken at the scene. Protection and maintenance of the airway was the commonest cause for concern related to pre-hospital care but it was seldom the opinion of the advisors that longer time or more management at the scene would have made a difference. This approach, combined with the use of pre-alerts from ambulance crews to the hospital is preferred to taking expertise away from the hospitals to the roadside.

Acknowledgements

This is the 21st report published by NCEPOD and, as always, could not have been achieved without the support of a wide range of individuals and organisations.

Reference