ORIGINAL ARTICLE

The casualty profile from the Reading train crash, November 2004: proposals for improved major incident reporting and the application of trauma scoring systems

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Objective: To report the casualty profile of the major incident at the Royal Berkshire Hospital, Reading, following the Ufton Nervet Train crash, November 2004. To make further proposals regarding major incident reporting and implementation of trauma-scoring systems.

Method: Retrospective analysis of emergency department and hospital notes. Calculation of index Injury Severity Score (ISS) and Trauma and Injury Severity Score (TRISS) in all patients.

Results: Of 61 casualties, the majority (74%) were seen in the minors area of our emergency department with a mixture of blunt impact and penetrating glass injuries. One died and 16 were admitted. 10% had an ISS >16. All surviving patients had a TRISS predicted probability of survival >90%.

Conclusion: We propose mandatory major incident reporting within 6 months of a major incident to aid development of a national database. As previously proposed, this will aid education and facilitate future major incident planning. We further propose the widespread use of trauma scoring systems to facilitate comparative analysis between major incidents, perhaps extrapolating this to develop a major incident score.

On Saturday 6 November 2004 the 17 35 London to Plymouth train carrying 300 passengers derailed as a result of crashing into a stationary van on the line at Ufton Nervet, to the west of Reading at 18 00. Of 76 casualties, 6 people died at the scene and 61 of the injured were taken to the Royal Berkshire Hospital in Reading, where the major incident plan was activated. The remaining nine casualties were taken to Basingstoke Hospital.

Fortunately, major incidents are not a common occurrence in the UK. The Department of Health requires all hospitals to have a major incident plan, and recommends regular testing of them. Rutherford suggested constructing a database to describe each major incident to facilitate future planning.¹ Although each incident can be very individual and present its own unique challenges, lessons can be learned. We present our experience of a major incident. As a result we promote the need for a national major incident database, in conjunction with the use of injury scoring systems, to facilitate planning nationwide.

METHOD

A retrospective analysis of both accident and emergency department and hospital notes for those patients admitted as a result of the incident was performed.

Inclusion criteria: patients with injuries directly resulting from the train crash, seen at the Royal Berkshire Hospital emergency department within 12 h of the incident.

Exclusion criteria: patients presenting to the emergency department on the day, who were not involved in the train crash, and those people with injuries resulting from the train crash but who presented after 12 h.

An Abbreviated Injury Scale (AIS) and a Revised Trauma Score (RTS) was calculated for all patients. From these an Injury Severity Score (ISS) and a Trauma and Injury Severity Score (TRISS) were deduced. These scoring systems are available on the Trauma.org website at <http://www.trauma.org/scores/index.html>

An extensive literature search was performed using Medline and Pubmed databases. Information was gained on the previous implementation of various trauma scoring systems, current UK policy on major incident planning and recent publications of relevance to this event. The keywords "major incident*", "major incident plan*", "train crash*" and "injury scoring system*" were used.

RESULTS

Operation of the emergency department was coordinated by the emergency department consultant and lead sister. Patients were triaged at the door to the relevant area by an emergency department staff grade doctor and the lead sister. The resuscitation area was staffed by two consultant-led trauma teams. The majors area was run by two orthopaedic and one general surgical consultants with support from three senior house officers (SHOs). The minors area was staffed with three emergency department specialist registrars (SpR)/middle grades and three SHOs. There were 18 nursing staff distributed throughout the department compared with nine at normal times. A consultant radiologist was available in the department, "hot reporting" all films.

From declaration of major incident, the first casualties arrived within 1 h. The department was cleared of all major incident casualties within 8 h. The department was reopened to walk in casualties after 9 h and the ambulance divert was lifted after 12 h.

A total of 61 casualties were seen in the emergency department at the Royal Berkshire Hospital.

The age breakdown can be seen in fig 1, with the majority being 36–65 years old.

The majority of patients were seen and treated in the minors area (45), typically requiring wound closure and limb splintage. Twelve patients were streamed into the majors area

Abbreviations: AIS, Abbreviated Injury Scale; GCS, Glasgow Coma Scale; ISS, Injury Severity Score; RTS, Revised Trauma Score; TRISS, Trauma and Injury Severity Score

Box 1

The Injury Severity Score (ISS), is an anatomical scoring system whereby each injury is assigned an Abbreviated Injury Scale (AIS) score from 1–6 allocated to a body region (head, face, chest, abdomen, extremities and external). Using the highest score for each body region, the three most severely affected body regions have their score squared and added together. AIS level 6 (unsurvivable injury) gives an automatic score of 75. The ISS is the first and most widely used trauma scoring system.² The Revised Trauma Score (RTS) is a physiological scoring system, which utilises the initial Glasgow Coma Scale, systolic blood pressure and respiratory rate obtained for the patient. Each value is multiplied by a specific figure, and the three totals added together.²

The Trauma and Injury Severity Score (TRISS) incorporates anatomical and physiological parameters to determine probability of survival from age, Injury Severity Score (ISS) and RTS scores via the formulae $P_s = 1/(1 + e^{-b})$. Revised several times with the edition of different coefficients. Most widely used scoring system after ISS.²

and treated for a range of injuries including head injuries, spinal injuries and blunt chest trauma.

Of the four patients treated in the resuscitation room, two had severe unstable blunt chest trauma, one was in cardiogenic shock and one had an unstable cervical spine fracture.

A total of 16 patients were admitted. Of these, 12 were admitted under orthopaedics and 1 each under general surgery, plastics, medicine and the intensive therapy unit (ITU). Figure 2 shows a summary of primary injuries sustained in patients admitted to hospital. One patient underwent emergency surgery within 4 h of admission, for application of halo traction for a C1 fracture. A further three patients were taken to theatre the following day, one for internal fixation of a radial fracture, one for wound debridement and one for pedicle screw fixation of an unstable L1 fracture.

The patient with cardiogenic shock died in ITU 10 hours post injury. The majority of the other admitted patients recovered quickly and were discharged within 48 hours. All but one of the patients were discharged within a week.

The ISS scores were mostly less than 16 (90%). Only two patients scored >35 and 39 patients (69%) scored <5. The patient that died scored a 75 due to having an AIS level 6 injury.

The ISS can be seen in fig 3 and the TRISS can be seen in figure 4. The values represent an estimate of percentage probability of survival. Our values ranged from 6.8–99.7%. All but one patients scored >90%. The patient who died in the hospital scored 6.8%.

DISCUSSION

Our database shows that the majority of casualties suffered relatively minor, but often multiple, injuries, most commonly bruising, minor fractures and lacerations. Injuries were sustained either as a result of blunt impact or broken glass. Admission was required for patients with extensive soft tissue damage, fractures requiring inpatient care and head and chest injuries requiring a period of observation. In contrast to other trusts, our orthopaedics department accepts referrals for head injuries and blunt chest trauma. The general surgeons accept abdominal and penetrating chest traumas (there is no cardiothoracic service on site). It is important that these differences are noted prior to

Box 2 Summary of events on scene

- 300 Passengers
- Medical Incident Officer – Berkshire BASICS doctor. Support from 12 other BASICS doctors
- Royal Berkshire Fire and Ambulance Service with back up—from the London Ambulance Service
- 250 able to walk to holding area
- Casualties identified and streamed in sectors at incident scene and at holding area
- Six Fatalities
- Thirty six casualties required ambulance transfer to hospital. Twenty five taken to Royal Berkshire Hospital. Further 9 taken to Basingstoke
- Further 36 casualties taken to Royal Berkshire Hospital by coach

comparison of this casualty profile with that of similar events reported at centres with a differing allocation of trauma responsibilities.

The heightened awareness of potential for terrorist attack since September 2001 has focused on the need for improved major incident planning. Hospital major incident plans have

Figure 1 Age breakdown of casualties seen in the emergency department during the event.

Figure 2 Primary major injury of admitted patients.

Figure 3 Injury Severity Score.

long existed, yet rarely been tested in real terms due to the relative low frequency of these events. In the UK, the Department of Health (DoH) issued guidelines in 1990, requiring regional health authorities to have comprehensive plans in situ for the response to a major incident.³ A review by Carley *et al* of 142 major incident plans from British emergency departments found only 4% fully complied with health service guidelines.⁴

The Royal Berkshire Hospital's major incident plan was last updated in October 2004 just prior to the incident. It is regularly tested in accordance with DoH guidelines and because of the hospital's close proximity to a number of potential major incident triggers. The plan worked well on the night, and a debrief meeting soon after the incident identified areas of concern and aspects to be improved upon. The main focus of concern centred on the lack of communication of information from the scene of the incident to the emergency department. Ryan *et al* recommend that a formal debriefing session takes place no more than 48 h after a major incident.⁵

Casualty profiling was suggested by Carley *et al* as a way to record the types of injuries sustained at a major incident, in order to facilitate planning and preparation for future incidents.⁶ They recommended that all hospitals who receive major incidents write a case report and include a casualty profile, to form part of a national database.

We acknowledge that each major incident is unique in terms of its casualty profile and that hospitals will differ in how they respond and the services that they can provide. However, a national database of major incidents can only serve to educate us all and improve the services we can offer.

The government report Facing the challenge: NHS Emergency Planning in England was published in April 2003 by the National Audit Office.⁷ One of three conclusions they drew was that the "Department of Health had still not found an effective way of disseminating the lessons learned from actual major incidents". They felt that a "proposed new national major incident database would be one way of sharing lessons and best practice across the country, and should be given priority". This document has recently been replaced by The NHS Emergency Planning Guidance 2005, published by the DoH, Emergency Preparedness Division. This provides extensively researched, well formulated and clear guidelines with regard to major incident planning but very little regarding major incident reporting.⁸

The Health Protection Agency (HPA) has an advisory role with regard to emergency planning and training National Health Service (NHS) organisations and the DoH. The HPA has formulated a database for major incident reporting. Currently, however, the database exists only in structure. It

Figure 4 Patient Trauma and Injury Severity Score.

has no information held on it, and the HPA is yet to provide guidelines on how to populate the database.

We propose that each hospital receiving a major incident is required to submit a casualty profile and debrief report to the HPA (or Emergency Preparedness Division of the DoH if it established a suitable database) within 6 months of the incident. This information would be stored on the database, and be accessible to hospital trusts via secure intranet links.

Trauma scoring systems, in use since 1971, provide a means of quantitative analysis of injury severity.⁹ Their adoption thus provides a useful tool for both research and comparative analysis. The variety of scoring systems and their respective merits have been analysed previously.² The ISS cut-off of 16 represents an approximate predicted mortality of 10% with an ISS of 16 or greater. This system has considerable limitations but provides a quick easy comparison with other events.² The TRISS accounts for physiological as well as anatomical parameters and shows that overall the percentage probability of survival despite a number of patients with severe multiple injuries remained high. More widespread uptake of these scoring systems in major incident reporting will allow for straightforward comparison between major incidents and is already practised widely in other countries.¹⁰⁻¹⁵

Data from trauma scoring systems could be further extrapolated to devise an overall major incident score for each incident. The score could include number of casualties, type of incident and ISS. This would aid in comparative analysis of different major incidents.

We further recommend the use of a nationally agreed major incident clerking pro-forma to allow for facilitated data collation and contribution towards the HPA national database.

CONCLUSION

We report the casualty profile from the Ufton Nervet train crash presenting to the Royal Berkshire Hospital. Injuries were assessed and analysed using injury scoring systems. We recommend a mandatory final report be submitted to the HPA/DoH within 6 months of any major incident. We make recommendations for the future use of injury scoring systems to allow for comparative analysis between major incident casualty profiles. An improved and unified method of major incident reporting is key to future major incident planning.

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