



Major trauma care in England:

Changing the state of a nation's healthcare system

TRAUMA IN PRE-NHS ENGLAND

Trauma is the leading cause of death worldwide in children and adults under the age of 40 years. In most western countries this is due to blunt trauma and road traffic accidents, although in the developing world penetrating trauma has a much larger role. The earliest recorded road traffic fatality was in England in 1896 when a young mother, visiting London with her daughter, was struck by a car travelling at a "tremendous speed". The car was perhaps the first aftermarket 'tuned car'; its gear

ratios had been altered by a Mercedes Benz engineer to double the flywheel speed. This collision, at four miles an hour, caused massive head injuries and the mother died at the roadside. The coroner at the enquiry was reported to have remarked "I trust that this sort of nonsense will never happen again". Unfortunately, just two years later, the first driver fatality occurred and today there are at least 20,000 cases of major trauma a year in the UK alone. These result in 5,400 deaths and, for those who survive, the injuries may change their

lives with permanent disability affecting both the patient and their family.

The early systems for the management of trauma in the UK were driven by two reports. The first in 1935, titled British Medical Association's Committee on Fractures,¹ and a subsequent study by the Interdepartmental Committee (1939).² These highlighted inadequate care of the injured patient throughout the British Isles. While these reports were for the most part ignored, they did result in the formation of the Birmingham Accident



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Hospital and Rehabilitation Centre, probably the world's first modern trauma centre, and widely regarded at the time as a radical plan to treat injured patients in a specialised setting. The Birmingham Accident Hospital was staffed by specially trained trauma staff, concentrating not just on immediate care but also on the rehabilitation of these patients. The system was not unlike that of the modern day Major Trauma Centre. Interestingly, the Birmingham Accident Hospital was envisaged as a role model for the delivery of trauma care in the UK, but, ironically, the formation of the NHS in 1948 halted the development of this national trauma service, and it was not until 2012 that serious attention was again given to a trauma system in the UK.

EVOLVING BURDEN OF TRAUMA CARE

Through the twentieth century the incidence of major trauma continued to increase, and while research and improvements were made in the management of trauma on both sides of the Atlantic, the UK continued to lag behind. The US recognised the issue and introduced their first civilian trauma centre in Chicago in 1966. This model was then rolled out across the country. The US networks work on a hub and spoke model with recognition from the American College of Surgeons for centres at Level 1 (major trauma centre), Level 2 (trauma unit) and other units. Strict criteria define required facilities and levels of care.

In 1988 the Royal College of Surgeons of England and the British Orthopaedic Association produced a "Report on the management of patients with major injuries".³ Again, this work highlighted the shortcomings identified by earlier reports but, importantly, the first of two major changes to the trauma system was initiated in the UK. This was the introduction of the ATLS course and standardisation of trauma care. There was a measured improvement in the care of traumatised patients after its implementation. The second major recommendation in the report was the need for continuous audit and research in injury and systems of care. This resulted in the first national trauma registry, the Trauma Audit & Research Network (TARN).

The first report from TARN looked at the data from just 33 hospitals. The summary showed that UK mortality rates were higher than that of the USA. It also identified that large inter-hospital variations in performance existed and there was an unacceptable delay before treatment. Additionally, it demonstrated that most initial care was provided by junior doctors.⁴

Through the 90s, hospital care appeared to have made a valuable but variable contribution to reductions in standardised mortality after injury in the UK, probably as a result of treatment by ATLS principles and the introduction of TARN. However, throughout the decade a significant variation in the case mix (severity of injury and age) was seen to affect number of survivors between the top and bottom 10% of UK hospitals. To try and combat this, TARN outcomes started to be reported with adjustments for likelihood of survival. A further worrying trend found throughout the 90s was with transfers. There had been a 41% increase since 1989 in the time between injury and the injured patient arriving at hospital, regardless of injury severity. However, when patients arrived at the hospital their quality of care had improved, with the proportion of severely injured patients seen first by junior house staff down by 41%.⁵

The next significant report was produced by NCEPOD (National Confidential Enquiry into Patient Outcome and Death) in 2007.⁶ The straphane reported was that 60% of patients in their study received a standard of care that was less than good practice. The report was based on case review of nearly 1735 patients over a three-month period. The report identified worrying trends in trauma care within the UK. By comparing case notes and careful case-by-case review, a panel of experts identified the quality of care provision in each case against acceptable standards. They yet again highlighted deficiencies in pre-hospital care, lack of designated trauma teams and, in particular, the lack of consultant input in the vital early stages of resuscitation. This report focused particularly on significant head injuries, the delay in imaging and the time to definitive care; a worrying problem in such a time-dependent injury. Yet

again it was noted that due to the relatively low incidence of trauma in the UK, it was unlikely that individual hospitals would be able to provide the specialist multidisciplinary care required. Their strongest recommendation was that regional planning for trauma care was essential.⁶

In part triggered by difficult parliamentary questions surrounding the NCEPOD report, the UK government appointed the first National clinical Director for Trauma, Professor Keith Willett, and commissioned a report by the National Audit Office on Major Trauma Care in England, published in February 2010. The audit office report focused on the health economics and provision of services, again highlighting the issue and found that "current services for people with major trauma are not good enough". Only 35% of patients with severe injury were seen by a consultant immediately on arrival at hospital.⁷

The management of trauma is always challenging. The variability of the clinical scenario and its rapidly changing course mean that senior input is vital early in its management. Patients often suffer complex, multiple injuries that require surgical and nursing care from multiple specialists: few district hospitals in England have the capacity to provide comprehensive care for these patients.

In summary, since 1988 a number of reports demonstrated significant shortcomings in the delivery of trauma care that meant that UK patients were not receiving the same quality of care as found in other countries. Research demonstrated a 20% higher in-hospital mortality rate in the UK in comparison with other countries' developed trauma systems.⁸ This culminated in Lord Darzi stating that there are "compelling arguments for saving lives by creating specialised centres for major trauma". His review of the NHS highlighted that trauma was a type of preventable disease and that our care was inadequate, culminating finally in political engagement.

THE DEVELOPMENT OF THE MAJOR TRAUMA SYSTEM IN ENGLAND

In response to this, the NHS in England set about redesigning and implementing a national trauma network. Differing from other countries,



this new system of care revolved around networks with a major trauma centre at its core, divided into regions of up to 4.3 million people. The 18 Regional Trauma Networks in England are designed to allow the rapid and safe transfer of these patients to designated major trauma centres throughout the country. These provide 24-hour consultant-led care. Expertise has been concentrated in 22 major trauma centres, with a further four centres providing care for children alone. The development of these networks has been clinically led by doctors, nurses and allied health professionals including paramedics and physiotherapists, to ensure that the patient receives the best possible care from the scene of the accident through to their rehabilitation at home. The aim is to get the right patient to the right hospital at the right time. The system started in London and then went live for the whole of England in April 2012.

BEST PRACTICE TARIFF

Changing a whole nation's health care can be a difficult thing to achieve. Even simple interventions such as changing a particular painkiller or blood pressure medicine can take years to achieve. However, the aspiration within the NHS was to achieve change rapidly and almost overnight. A key lever for change was the introduction of Best Practice Tariff (BPT). Within the healthcare system in the UK each hospital episode generates income based on a tariff system (linked to interventions and ICD diagnoses through a complex system of Health Resource Group Codes). In addition to the tariff available for the patient's treatment, BPT allows hospitals to claim a 'bonus' payment for achieving best practice. Best practice was initially measured through the achievement of three key performance indicators (although more will be introduced with time). In the case of major trauma, these are: that the patient is seen by a consultant trauma team leader rapidly on admission, that a rehabilitation prescription is completed on discharge, and that the patient's outcome data are entered onto the TARN network. For patients requiring transfer for complex but not life-saving trauma surgery e.g., acetabular fracture surgery, patients must be transferred within 48 hours of referral. In other areas of health care this has been an extremely effective lever for change.

ROLLING OUT THE SYSTEM

Changes in such a complex system will take up to five years before the full benefits become

evident but the early results show that there has been a tremendous improvement in trauma care throughout England. Communication, from paramedics at the accident scene or in the ambulance, has greatly improved so that the hospital can be alerted in advance and the patient met by a trauma team, led by a consultant. With this pre-alert, across the UK 95% of patients are now met by a consultant-led trauma team. Once they arrive at the major trauma centre, patients now receive much more rapid care with faster times to key tests, such as a CT scan. This allows the trauma team to identify life-threatening injuries more quickly and therefore patients are having life-saving operations at an earlier stage. Although patients are spending slightly longer in the ambulance or helicopter, the more rapid and efficient care provided by an expert team at the major trauma centre means that the total time to these key operations is now shorter.

Patients who suffer complex fractures and soft-tissue injuries are also benefiting from the new system. These injuries, while not measured in raw mortality statistics, often cause permanent disability and require specialist surgery. Previously, TARN data suggested that these patients could wait up to seven to ten days before being transferred to specialist units. Changes in the system now mean that over 90% of these patients are transferred to the right hospital within two days of injury.

Results from the TARN audit for the first 12 months since the networks went live confirm that these changes have greatly benefited patients, and the chance of a patient surviving severe trauma in England has increased by 20% (one in five) in the year since the major trauma networks went live.

Recovery from severe injury takes up to two years. As well as improving survival, a key aim of the major trauma networks is to improve the quality of life in the survivors. The networks have also redesigned the rehabilitation pathways to give the patients the best chance of recovery following surgery. It is predicted that for every additional survivor, three further patients will make an enhanced recovery, which hopefully will allow them to return to their families and to work.

It is thought that the annual loss of economic output as a result of major trauma is between £3.3 and £3.7 billion in the UK.⁸

It is clearly early days since the introduction of regional trauma networks. The initial results appear promising but it will take time to gauge

its full impact. Ongoing audit and research will be vital to assess the results and guide further interventions. The impact of the reorganisation of rehabilitation services has also yet to be assessed.

VICTORIA STATE

There are subtle differences between nominated Level 1 centres (such as those implemented in the US) and an integrated trauma network. With centralised control and an incentivised BPT system NHS England has been able to produce a purpose-built integrated trauma network which covers the entire population and will hopefully reap dividends in quality of care, delivery of treatment, outcomes and research.

The nearest example to this is the Victorian State Trauma System in Australia. Although not as populous as England, there are 5.7 million people in the state, about a 10th that of England. In 2000, the Victorian State Trauma System (VSTS) was established in response to a review by the Ministerial Taskforce on Trauma and Emergency Services.⁹ This resulted in a highly co-ordinated system upon which much of the UK network has been modelled, with the Major Trauma Services being at a central hub, and other providers being the spokes transferring directly, or after appropriate patient stabilisation, to these regional centres. One of the key areas identified in what was until recently the world's largest integrated trauma network was the importance of triage; the identification of the major trauma patient and its subsequent transfer to an appropriate unit in a timely fashion. The review also highlighted the importance of effective communication, education and audit. The Victorian State Trauma Registry is a comprehensive review of this system, and includes excellent data on quality of survival of major trauma patients. It produces an annual report that is used to monitor the system and co-ordinate changes that directly affect patient care.

Since its inception, they have noted a 37% decrease in the likelihood of death for hospitalised major trauma.¹⁰ This reduction in mortality was mostly noted after the first year of its introduction and was felt to reflect the full impact of the implementation and the maturation of the VSTS. Their registries' unique assessment of outcomes in survivors has also shown significant improvement in function, return to work, and other health scores. This probably reflects both improved definitive care by the trauma service and enhanced rehabilitation post discharge. Either way, hopefully our own Major Trauma Network programme will follow a similar trajectory.

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