LESSONS FROM BASRA AND BASTION FOR THE MODERNISATION OF NHS TRAUMA CARE

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Painting: Casualties arriving at Camp Bastion Hospital Helmand, 2008 (oil on canvas, by David Rowland, reproduced by kind permission of the artist)

Introduction

War has often been the greatest stimulus to technological and organisational innovation. The past decade has seen a transformation in the modus operandi of the Defence Medical Services (DMS) and of the quality of its clinical outputs under the extreme pressures of war in Iraq and Afghanistan, and under a continuous media and political spotlight. Much of the clinical work of the DMS has involved the treatment of complex trauma among civilians and combatants. This has arisen from the nature, tactics and weaponry of sophisticated insurgencies, and from the increased survivability of troops in combat. This, in turn, has come about from a range of "front line" developments, which have included:

- A much higher standard of training of all service personnel in medical matters, and the issue of easy to use, standard protocols in robust pocket flip-chart format.
- The personal issue, to all troops, of high quality life saving devices, including modern tourniquets and chest seals.
- Developments in body armour, which provide survivability to direct hits on the torso from high velocity bullets and fragments.
- The embedding of a higher proportion of highly trained, competent and courageous medics in front line units, as evidenced by the significant number of gallantry awards won by junior medics, including Military Crosses awarded to young women.
- The refinement and speed of helicopter evacuation to definitive care facilities, and the development of in flight emergency pre-hospital care.

The consequence of these developments has been to deliver alive to field hospitals casualties with injuries which would not previously have been survivable, including one, two, three and four limb traumatic amputations, massive pelvic and perineal trauma, blast, burn and multiple fragmentation injuries. Our understanding of how best to manage these injuries to produce "unexpected" survivors has been bought at a huge cost in life and limb to those young people who have been put in harm's way. We owe it to them to ensure that every possible clinical lesson is extracted and fed into the public and professional consciousness to inform and advance civilian practice and complex trauma care.

There are, of course, major differences between the high energy trauma of combat and the blunt, low energy trauma of civilian life, with rare exceptions arising from the criminal use of handguns or from terrorist outrages. The lessons for the NHS, and particularly to inform the development of the national NHS Trauma network, are considerable, and are not always intuitive or self-evident.

The patho-physiology of complex trauma

We have, to a considerable extent, had to unlearn many conventional practices in the care of the acutely injured and bleeding patient, with significant implications for the management of major haemorrhage across a range of conditions. The correction of the "4Hs", Hypothermia, Hypovolaemia, Hypocoagulability and Hypoxia, are as important as any application of skilled surgery.

- **Hypothermia**
  The body's physiological functions, and in particular the clotting cascade, are optimised to function at 36.8deg C. All trauma casualties are cold, even in desert conditions, and all reasonable efforts should be made to anticipate and (substantially) correct hypothermia before embarking upon major surgery, not least to optimise coagulation.
- **Hypovolaemia**
  The traditional practice of pouring in crystalloids and colloids to expand fluid volume is, in effect, toxic to the major trauma or massively bleeding patient. These fluids often contribute to the cooling of the body and substantially dilute out the remaining clotting components and platelets, thus worsening coagulation problems.
- **Hypocoagulability**
  In the case of major haemorrhage, early and generous use of (fresh) blood with balanced volumes of platelets and clotting factors is essential, and should supersede the "little and late" conservative practices in transfusion of the past. While this message is gradually getting through to the NHS Operating Theatres and Resuscitation Rooms, its uptake is as yet patchy in situations of major haemorrhage where it is important. Disseminated Intravascular Coagulation should no longer be seen as a sad and inevitable end stage problem in major haemorrhage, but as an explicit failure of optimal physiological management.

  The coagulation cascade can be seriously disrupted during the chaos of a major resuscitation in ways which may not be immediately apparent, and for which conventional blood tests of coagulopathy are too slow, too late and too misleading. To this end, the introduction of thrombo-elastometry devices such as the Rotem machine to the operating theatre has transformed the per-operative management of major trauma by those theatre teams who are familiar with its use.
- **Hypoxia**
  Tissue hypoxia is a toxic and per-morbid state. It is corrected both by adequate and effective ventilation, and by the restoration to the circulation of sufficient functional red blood cells through transfusion.

What sort of Receiving Facility?

In the current debate about Level 1 NHS Trauma Centres, and in the predictable scrum for the resources and prestige associated with regional ownership of the brand, it is easy to overlook the lessons of our Field Hospital Squadrons in Basra (2003 to 2009) and Camp Bastion, Helmand (2006 to present). Each of these hospitals has been a relatively small and leanly resourced trauma receiving centre, with less than 100 highly motivated, well trained and increasingly experienced staff (including command and control elements), focussed primarily on "damage control" resuscitation which may or may not include immediate and/or staged surgery. The key features of this organisation have been:

- Highly drilled trauma receiving teams in the Emergency Department.
- Rapid access to digital imaging, CT scanning and an operating theatre.
- A high degree of cooperation and understanding between the A & E consultant leading the trauma teams; the orthopaedic and general surgeons, and the anaesthetists.
- Ready access to High Dependency and Intensive Care beds.
- An effective "back door" operation, whereby sedated and ventilated patients can be transported by air to receiving hospitals in the UK or elsewhere, which are appropriately equipped with the wide range of specialist resources for further management, reconstruction (now based primarily around the Birmingham group of hospitals, with Birmingham International Airport as the principal reception airhead) and rehabilitation (as, for example, at the much expanded Headley Court).

The point is that the Primary Receiving Centre does not have to be a large teaching hospital with all of the tertiary and quaternary resources immediately to hand. It can be a conventional or a remote district general hospital, as part of a sophisticated, intelligent and flexible trauma network, so long as:

a) It can deliver high quality, trained and informed A & E teamwork and consultant led diagnosis, resuscitation and early survival interventions.

b) It can package and transfer selected high risk and (if necessary) ventilated patients in appropriate vehicles across the network to the appropriate tertiary centre.

The training of trauma teams

The NHS possesses, in abundance, the people who are capable of delivering trauma services of this quality. We know this, because most of the staffing of the hospitals in Basra and Bastion has been by those working in the NHS, including a large proportion of NHS-based reservists. The issue is how to organise and train NHS trauma teams to secure these outputs. Again, we can learn much from the way the DMS has adapted and organised itself.

- **Individual training**
  In terms of individual training, all members of the DMS pass through core and graduated training and promotion programmes, designed to inculcate common personal skills, standards and values across the piece, from the junior combat med tech private soldier to the late-entry consultant reservist.

  This is no different to that provided during early academic and on the job training for all NHS doctors and allied health professionals, and there is plenty of opportunity to refocus the teaching of the pathophysiology and management of complex trauma in the undergraduate curriculum, backed up by postgraduate courses and certification, including modules built into the mainstream postgraduate qualifications.

  For clinicians, expertise is increased by a range of specialist short courses, including those for mangled extremities, neurosurgical trauma and advanced trauma life support, along with the cadaveric based Definitive Surgical Trauma Skills course at the Royal College of Surgeons of England, to ensure that all deploying clinicians have the appropriate portfolio of skills to manage cases which they may rarely if ever see in NHS practice.
- **Collective training**
  This is an area where the DMS has much to teach the NHS. The use of well-organised and targeted "dry" simulation in collective clinical training is an extraordinarily powerful organisational tool. The National Defence Hospital Trainer at the DMS Training Centre in Strensall near York is a low-cost, but very powerful, facility within a converted and environmentally controlled former warehouse, in which hospital squadrons are repeatedly exercised to various degrees of intensity before deployment. These exercises culminate in realistic, pressured exercises using advanced simulators and the acting talents of "Amputees in Action", which ensure seamless transition of hospital teams into the operational environment as Reserve and Regular Hospital Units deploy on rotation.

  Specialist clinical teamworking is now substantially enhanced by the evolving Military Operational Surgical Training (MOST) course at the RCS England, where clinical and theatre teams are brought together in the Raven Centre to work through a range of clinical scenarios.

  The provision and use of such simulation in the NHS environment would allow NHS Hospitals with high level trauma responsibilities and services to send designated teams to regional or national training facilities to replicate this training model in a format optimised for civilian trauma. There would be a considerable benefit in advancing the general culture of teamworking which is now wholly embedded in the culture and daily work of the DMS.

Concluding comments

There are many other factors which have contributed to the effectiveness and rapid learning culture of the DMS. For example, trauma audit has become central to operational effectiveness, and to the design of equipments to optimise protection. Weekly telephone conference calls between deployed clinical teams and UK treatment facilities have allowed a rapid interchange and feedback of lessons learned, and have enhanced the collegiate approach to casualty care.

Many surgeons and members of ASGBI will be involved in discussions about the generation and organisation of local trauma services, regional trauma centres and networks. While DMS and civilian practice may be very different in detail, the lessons learned and applied by the DMS in the complex and austere environments of deployed operations have considerable value in informing the debate and practice of the development of effective UK wide trauma networks.

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