

THE COMBAT CASUALTY CARE SPECIAL EDITION

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<C>ABC, DCR, DCS, RSI, MERT, MERT-Enhanced, 1:1, IRT, JTTR these contemporary abbreviations are increasingly used in conversations regarding current operational capability, are argued about passionately, and are frequently misunderstood.

As an example, take the debate on how and where to perform surgery. Surgery is best performed by trained people operating within their capabilities on a patient in as good a physiological condition as possible, with the right resources, working in a safe, comfortable environment (this can be summarised as; right patient, right place, right surgeon, right time).

Forward surgical facilities may allow rapid access to surgery but as these facilities are required to be manoeuvrable, they are inevitably more limited in resources compared to larger fixed facilities. Rapid evacuation from the point of wounding to a more capable, well resourced, fixed facility could be preferable but this might also lead to delays in the initial treatment of critically injured patients if the tactical situation prevented timely evacuation or the transfer time (or distance) from battlefield to the larger, more static, facility was excessive.

While much can be achieved even when constraints are imposed on available resources, there comes a time when the situation falls below the minimum standard necessary to allow safe and effective surgery.

This is well argued by Coupland [1] when describing high mortality rates in casualties with abdominal injury in Kabul, 1992 due to inadequate resuscitation and a lack of post operative supervision. This was a situation where large numbers of casualties presented to a hospital with a disrupted infrastructure.

Lessons from the paper include the role of fluids and antibiotics in extending the timeline to definitive treatment for most patients and the need for realistic triage so that resources are not wasted on people who are going to die irrespective of whatever intervention is undertaken (this includes those with injuries outside the scope of current medical practice).

Understanding who will and will not survive may appear straightforward: a casualty who has been decapitated dies instantly at the scene. A casualty with a sprained ankle should survive; but if they are isolated in mountainous or desert terrain they may perish from the effects of cold, heat and dehydration. Equally, if they are bleeding from a limb (potentially survivable) but the tactical situation prevents care reaching them (a minefield or an ongoing fire-fight) then they may die from a treatable injury. When comparing outcomes from different datasets, it is imperative that the definitions of survivability or salvagability are clearly stated and are comparable. Similarly when examining other surrogate markers of surgical performance such as

amputation rates and limb salvage rates, there must be explicitly stated definitions of what is being reported (for example. amputation rate being: the number of amputated limbs / number of limb injuries; or number of amputated limbs / number of attempted limb salvage operations; or number amputated limbs / number of battle casualties etc). It is time to be moving towards accepted international consensus definitions of such terms that can be accepted within military surgical practice to allow standardised comparisons.

Studying the trauma populations generated by our own forces [2-4] and others [5-9] is one part of learning where the lines between survival and non-survival are drawn and what influences these, including, of course clinical interventions.

The current Battlefield Advanced Trauma Life Support (BATLS), [10] course is constructed around this concept. Simple interventions done well and close to the point of wounding aim to buy time to move a casualty through the system to the next level of care.

Planning a deployed military medical service uses the estimate process and includes who is at risk, from what, and when and how this risk can be mitigated [11,12]. The plan has to consider logistic constraints imposed by the military situation.

Returning to surgery, if we can accept that a certain combination of people, equipment and resources is needed then the military imperative is to make this capability as physically light and small as possible to facilitate manoeuvrability without compromising the surgical capability or standards of care. This inevitability impinges on the argument about facilities being 'fixed' when operating or when holding the critically ill (until evacuated) but if a 'laboratory' capability can be reduced to a hand-held near-patient blood analyzer (i-STAT® machine) and a portable box developed to maintain the cold chain for packed red cells and thawed plasma (the Golden Hour Container®), then there are logistic attractions. Conversely, there are also obvious limitations of capacity and capability, but this is part of the commander's balanced risk assessment. This must be based on tactical considerations but informed by the clinical consequences. With new approaches to resuscitation, the classically accepted timelines to surgery may now be no longer be relevant. With forward deployment of blood products it may be that these timelines can be extended with obvious implications for the optimal deployment of surgical resources.

One 'line of risk' can be drawn between 'resuscitation' and 'surgery'. Although this is a simplistic distinction (as surgery is part of resuscitation and vice versa), it does allow consideration of concepts. Internal debate has centred on whether components of resuscitation can be separated from surgery while still being effective in maintaining clinical performance standards for overall survival and morbidity. The options are to place a light, ground-based medical treatment facility in support of forward operations (that has a smaller logistic footprint than resuscitation and surgery combined) or to utilise support helicopters (SH) for primary retrieval direct to the hospital (R2E or R3) from point of wounding. Eastridge et al [13] describe the American view of

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implementing a Military Trauma System on operations in Iraq, modelled on the successes in the civilian systems. The authors describe the evolution of the Trauma System as the conflict matured, from the initial small surgical units of the Army Forward Surgical Teams and Navy Forward Resuscitative Surgical System to larger, more capable, fixed hospitals equivalent to major trauma centres in the USA.

Pivotal to the optimal deployment of surgical capability is the clinical effect that can be realistically achieved in the air during primary retrieval of the critically injured by SH. The operational environment may not permit a period of stabilization on the ground before SH transport because of the predictable physical threat to the aircraft from direct and indirect fire.

The distinction between the BATLS definitions of field resuscitation (Role 1) and Advanced Resuscitation (consultant-based at Roles 2 and 3) has become blurred with consultant-based clinical teams routinely delivering pre-hospital trauma care in Afghanistan: opportunities for extending the armamentarium of clinical interventions on the SH platform continue to be exploited.

This capability has been historically referred to as the Incident Response Team Medical (IRT), but since 2006 in Afghanistan it has been referred to as the Medical Emergency Response Team (MERT) and the MERT-Enhanced (MERT-E), defining two levels of capability. In its basic form MERT has consisted of an RAF State Registered Paramedic and an emergency nurse; MERT-E has added a consultant (emergency medicine or anaesthesia) and a fourth practitioner (medic, nurse, junior doctor or operating department practitioner).

Advanced interventions carried out by the MERT/MERT-E will depend on the exact composition and skill set of the team, but may include surgical airway, chest drainage, intraosseous access [14], blood / blood product administration (doctors only) and rapid sequence induction of anaesthesia to facilitate intubation. The exact impact of individual interventions is difficult to quantify [15], but mortality and morbidity outcomes can be identified through detailed analysis of the Joint Theatre Trauma Registry [16] with clear trends in system performance. The military trauma system differs from the National Health Service in that care is embedded at the point of wounding and begins immediately as self-aid or buddy-aid, complimented by life-saving interventions from the Army Team Medic (1 in 4 combat soldiers), the professional “cap badged” medic, and nurses and doctors at Role 1. This sophisticated, integrated, step-wise trauma system from point of wounding to definitive care is the overarching reason for the demonstrably high rate of “unexpected survivors” [17]. The trend of improvement in the standardised mortality ratio [17] must be attributed to a combination of a paradigm shift in the approach to the combat injured, equipment advances, effective and dynamic training, rigorous audit and governance and, importantly, organisational learning.

This special edition of the Journal of the Royal Army Medical Corps explains the rationale behind emerging clinical doctrine concepts, describes the components of the deployed military trauma system, and demonstrates the outcomes of our recent practice advances.

Events do not stand still. We must continually appraise and adjust our practice as new evidence is presented. What is certain is that intensive daily effort is needed to maintain quality standards and to manage incremental clinical change: what is uncertain is the discontinuous innovation around the corner and how this may significantly change our future practice. We encourage all DMS clinicians to recognise the fragility of the trauma system as being only as strong as its weakest component, and to maintain our excellence in combat casualty care delivery through vigilance for system under-performance, an accepted responsibility for quality data capture, and scholarly initiative.

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