

MILITARY PRE-HOSPITAL CARE: WHY IS IT DIFFERENT?

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Introduction

Military pre-hospital care encompasses a wide range of clinical capabilities from individual first aid (self aid or “buddy” aid) through specialist, physician-led, multi-disciplinary, helicopter borne teams.

While the helicopter borne teams have rightly attracted public attention and plaudit [1] it is important to understand the continuum of acute care (of which pre-hospital care is the first component) that is responsible for maintaining and improving UK combat casualty care outcomes. A crude indicator of trauma system performance based on the “percentage died of wounds” rate suggests current performance is better than any historical precedent [2].

This paper describes the contemporary model of UK military pre-hospital care and its relationship within an overarching end-to-end system of trauma care. Models are used to contrast civilian and military healthcare systems.

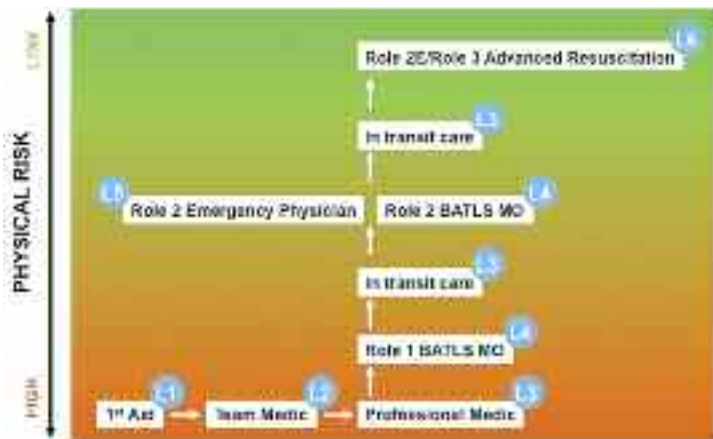
inversely related to the level of threat (Figures 1a & b): strictly limited interventions are practised within Care Under Fire, increasing in complexity through Tactical Field Care, Field Resuscitation and Advanced Resuscitation [5].

This means that there is a common language and common philosophy throughout the series of incremental courses, working within an overall governance structure of Clinical Guidelines for Operations [6].

Military V Civilian EMS System

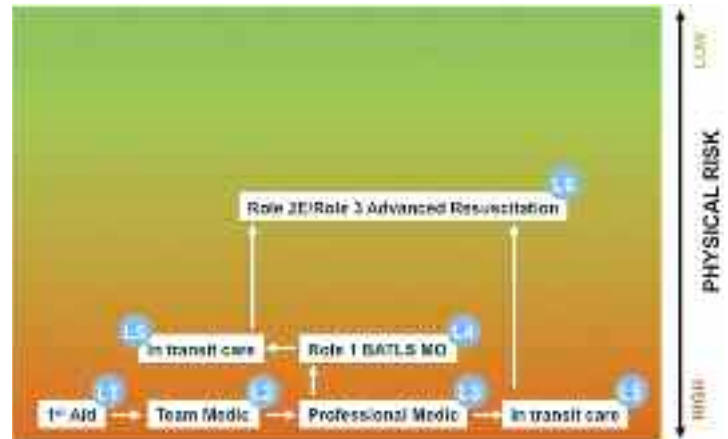
A principal difference between civilian and military care is that the ability to provide life-saving treatment in the military environment is embedded at the point of injury (or ‘point of wounding’) (Figure 2).

The nature of the battlespace demands all personnel have individual first aid training: every soldier can administer life-



RISK-CAPABILITY MODEL: TRADITIONAL LINEAR EVACUATION

Figure 1a. Levels of clinical capability (Level 1 to Level 6) in relation to physical risk of the provider during traditional linear evacuation.



RISK-CAPABILITY MODEL: ASYMMETRIC OPERATION (IN-TRANSIT CARE FROM SH BORNE MERT-E)

Figure 1b. Levels of clinical capability (Level 1 to Level 6) in relation to physical risk of the provider during evacuation in asymmetric operation.

Military Care Continuum

All soldiers are trained to a common paradigm, with the skills and equipment to deliver self-aid or “buddy aid” immediately following injury [3]. The military paradigm, <C>ABC, differs from the civilian and recognises the importance of catastrophic external haemorrhage as a potential cause of early and avoidable battlefield mortality [4].

The delivery of enhanced pre-hospital intervention beyond first aid is dependent on both the training of the provider available and the environmental threat. Current tactics and procedures support delivery of a stepwise clinical interventional capability, which is



Figure 2. UK Military Emergency Medical System.

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saving first aid focused on triage, external haemorrhage control, simple airway procedures, fracture immobilisation, analgesia and either keep an injured casualty warm, or cool a heat injury. One in four combat soldiers has enhanced first aid training (the Army Team Medic [7]).

Mechanism Of Injury

Military trauma is different to UK civilian trauma, with the prominent mechanisms being explosive devices and gunshot [8]; military “major trauma” is also statistically more severe ($p < 0.0001$) when compared to 183 NHS hospitals’ experience recorded within the National Confidential Enquiry into Patient Outcomes and Deaths (NCEPOD) [8] (Table 1).

ISS Range	UK Military Joint Theatre Trauma Registry (JTTR)	NCEPOD 2007
16-24	26.4%	56.5%
25-35	22.3%	35.1%
36-75	51.3%	8.4%

Table 1. Comparing injury severity profiles of UK field hospital and NHS hospital trauma populations.

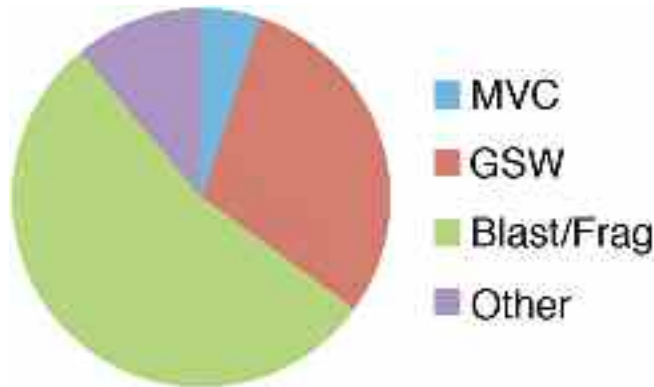


Figure 3. Injury mechanisms recorded on UK Military Joint Theatre Trauma Registry 01 Apr 06 to 30 Sep 07 [8]
MVC = Motor Vehicle Crash; GSW = Gunshot Wound; Frag = Fragmentation

Figure 3 illustrates the difference in injury mechanism when it is recognised that 56.3% of NHS major trauma relates to motor vehicle crashes. It is therefore perhaps not surprising that different treatment paradigms are required that prioritise the control of external haemorrhage. This is represented by the *Haemostasis Ladder* (Figure 4) and implies that associated equipment (tourniquet; topical haemostatic agent) must be available close to the point of wounding.

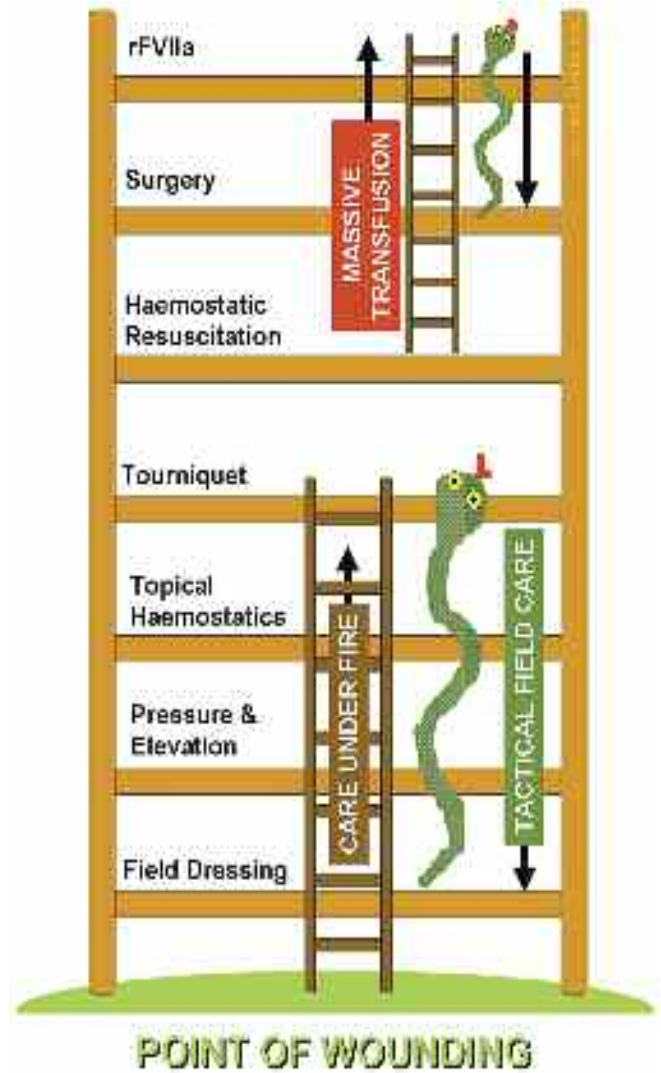


Figure 4. The Haemostasis Ladder. Follow the main rungs of the ladder. In Care Under Fire it is permissible to immediately apply a tourniquet for a bleeding limb (follow lower central ladder), but during Tactical Field Care the provider should consider removing the tourniquet and using conventional means to control peripheral bleeding (follow snake from head to tail to return to first rung of main ladder).

Lessons from the deployed UK and US military have shown far forward interventions to be very effective [9,10]. In UK these lessons translate across to civilian practice (management of stab and gunshot wounds in inner city areas; accidents with farming equipment in isolated rural environments).

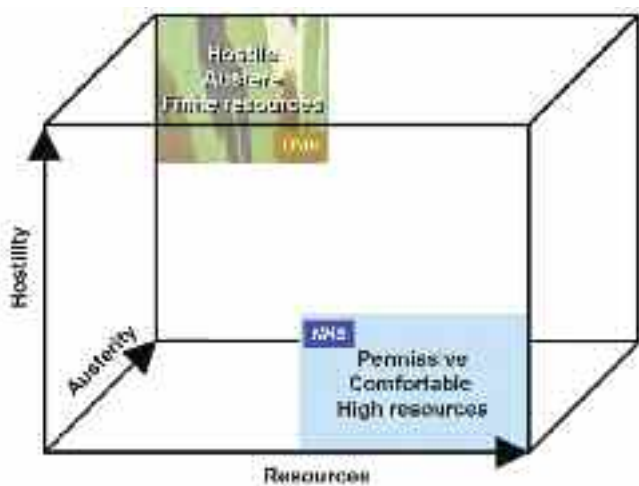


Figure 5a. NHS vs Defence Medical Services. Compared to the NHS, the field hospital functions in a hostile (direct and indirect enemy fire) and austere (desert) environment with finite resources (long, intercontinental supply chain).

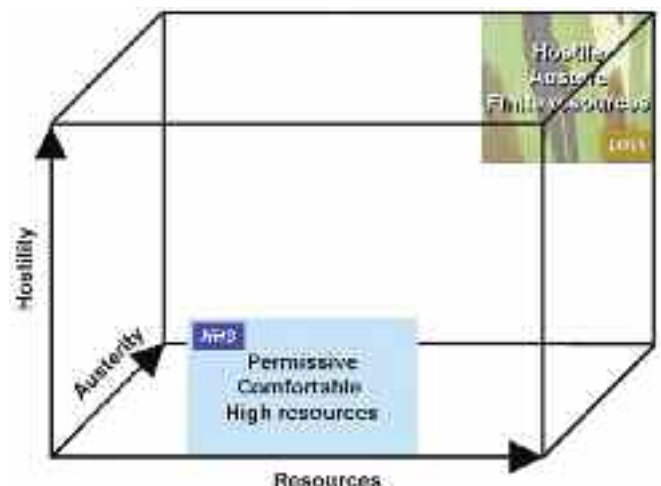


Figure 5b. NHS vs DMS (Major Trauma Management). Model 5a is true in circumstances except major trauma management, where the seniority of personnel, the equipment and the processes are superior to those available in the majority of the NHS.



Figure 6. UK Military Trauma System.

Military Trauma System

Compared to NHS, the DMS currently deliver care predominantly in an austere (desert) and hostile (enemy contact) environment with finite resources (hospital is at the end of a supply chain measuring thousands of miles). Nevertheless, in terms of human resources targeted at major trauma, DMS benchmarks above most of the NHS for the seniority of staff [8], with resident consultants in emergency medicine, anaesthesia, general surgery and orthopaedic surgery. This is modelled in Figures 5a and 5b.

The military trauma system can be seen as discrete packets of integrated care delivery, overarched by a single system of governance and supported by a unified, stepwise training pathway (Figure 6).

This trauma system is developing continuously, incrementally and by step change. An example has been the implementation of the new concept of damage control resuscitation [11].

Trauma management in military operational areas has been highlighted by the Healthcare Commission in 2009 as an example of exemplary practice and one that “the NHS could learn from in the delivery of emergency care” [12].

Comparative Timelines

There are predictable differences in the military and civilian pre-hospital care timeline (Figures 7 a-c). Care starts at the time of injury in the military system, as skills and equipment are embedded at the point of wounding. Usually greater distances are encountered in the military environment. Theoretically this will extend the timeline, although there is no objective evidence of this and different transport methods are routinely used to mitigate the risk. Civilian pre-hospital care of the critically injured may incorporate a period of on-scene stabilisation after the arrival of a medical support team (“stay and play” philosophy); in the current combat environment the specialist medical support team will spend only a couple of minutes on the ground in order to take a handover, load casualties, then provide assessment and treatment in flight (“scoop and play”). At the hospital, the military culture is rapid stabilisation for immediate surgery and ED times are characteristically short; this is facilitated by joint specialty consultant-based decision making.

System Performance

System performance is assessed by detailed analysis of patient notes and clinical outcome [8,13]. The model of the joint theatre governance system is summarised in Figure 8.



Figure 7a. Civilian pre-hospital timeline.



Figure 7b. Military pre-hospital timeline. MERT = Medical Emergency Response Team; EHLS = Emergency Helicopter Landing Site.



Figure 7c. DMS vs NHS pre-hospital timeline.

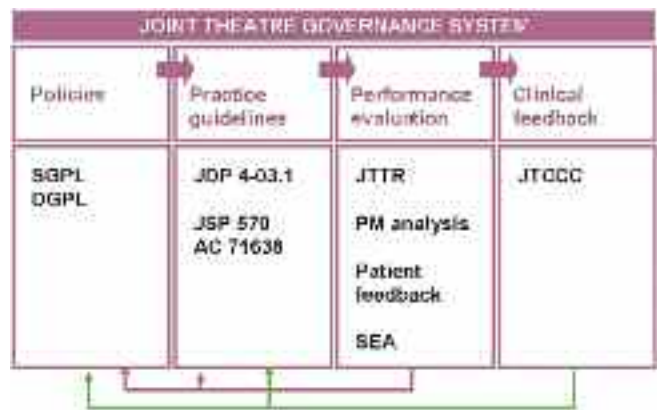


Figure 8. The Joint Theatre Governance System. SGPL = Surgeon General’s Policy Letter; DGPL = Director General’s Policy Letter; JDP = Joint Doctrine Publication; JSP = Joint Service Publication; AC = Army Code; JTTR = Joint Theatre Trauma Registry; PM = Post Mortem; SEA = Significant Event Analysis; JTCCC = Joint Theatre Clinical Case Conference.

This process has generated a number of mathematically unexpected survivors using international models. These unexpected survivors are clustered after April 2006, which coincides with (a) the adoption of the <C>ABC treatment paradigm; (b) the introduction of commercial tourniquets, topical haemostatic agents and adult intraosseous infusion systems; (c) the establishment of the Army Team Medic advanced first aid clinical capability [7]; (d) the implementation of an extensively revised Battlefield Advanced Trauma Life Support course [5]; (e) the implementation of the “enhanced medical emergency response team (MERT-E) [14] and; (f) from 2007, a new proactive approach to coagulopathy (“haemostatic resuscitation”) [15].

It is difficult to dissect how much system performance improvement can be attributed to individual changes.

Furthermore, an organizational learning effect from the frequent deployment of clinical staff, together with modifications in injury severity scoring (to more accurately reflect the severity of combat wounds) may also contribute in some way to the perceived improved system performance.



Figure 9. The Medical Emergency Response Team.

Military HEMS

Physician-led, helicopter-borne pre-hospital medical teams have been utilized consistently by DMS since operations in the Balkans. The background of the medical officer (primary care vs secondary care; anaesthetist vs emergency physician) has varied between operations, with the base location of the support helicopter, SH, being a key determinant (where SH is co-located with R2E/R3 there has been opportunity for secondary care engagement).

The training and experience of the medical officer has also varied from a General Duties Medical Officer (without any specialist qualifications and no previous pre-hospital care experience) to a hospital consultant (with FRCA/FCEM, Diploma or Fellowship in Immediate Medical Care, BASICS accreditation and practical pre-hospital care experience in BASICS or HEMS).

Physician-led pre-hospital teams are used in civilian healthcare systems in UK, Europe and Australasia. Published civilian experience of the benefit of such teams over non-physician delivered care is contradictory and it is possible to construct an argument to make either case.

Two internal audits conducted between May 2006 and February 2008 have been undertaken in an attempt to quantify the value of a doctor as part of the helicopter-borne team (Boxes 1 & 2).

In the period Jan-Feb 08, 186 casualties were transported by helicopter on Operation TELIC (Iraq), with a doctor as part of the team in 129/186 (69%) cases. The doctor was recorded to have “added value” in a standardised return to headquarters in 119/129 cases, or in 92% of the cases where a doctor was utilized.

The subjectivity of this assessment was recognised and action taken to reduce this in the future by annotating whether the added value is from a clinical intervention, a drug administered, or a judgement made.

Box 1. Audit of perceived added value of doctor on MERT.

In the period 04 May 06 to 31 Jul 07, 684 consecutive patients transported by helicopter on Operation HERRICK (Afghanistan). In 595 (89%) the clinical lead was identifiable and in 215/595 (36%) of these a doctor-related intervention was performed.

In 38/215 skills were performed that are restricted to medical officers (RSI, thoracotomy, thoracostomy, femoral nerve block); in 40/215 analgesic drugs were given that are restricted to medical officers (ketamine; fentanyl; diamorphine); in 31/215 morphine IV was given directed by a medical officer; in 42/215 skills were performed in flight where an experienced doctor would add value in making a judgement to perform the skill and/or its practical application (surgical airway; chest drain; needle decompression; sternal/tibial intraosseous infusion).

Box 2. Audit of medical officer interventions on MERT.

Identifying When A Medical Skill Set Is Required

Figure 10 offers a pragmatic approach to assessing the need for MERT or MERT-E level of capability. Where there is a high intensity of operations, a substantial population at risk and prolonged timelines then the requirement to project forward “advanced resuscitation” is intuitively justifiable. With short timelines, low intensity operations and a small population at risk then MERT without enhancement is arguably appropriate. This debate is integrally linked with the debate regarding the optimal geographical placement of surgical teams in the battlespace [16].

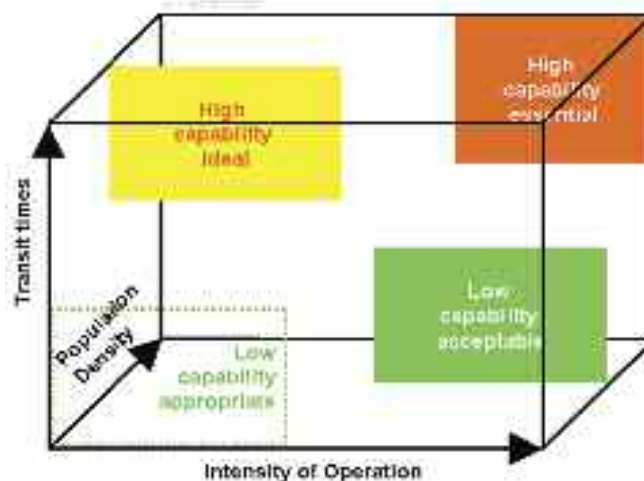


Figure 10. MERT clinical capability planner.

Defining The Medical Skill Set

The key question is, then, “What interventions contribute to survivor outcome?” If, for example, it turns out to be pre-hospital anaesthesia and use of blood products then team training and selection need to reflect these skill sets. There are ongoing work strands to analyse the Joint Theatre Trauma Registry data to determine, where possible, the impact of specific interventions on outcome. In parallel, linked research at the Defence Science and Technical Laboratories (Dstl) is currently evaluating a range of resuscitation strategies for blast and ballistic injuries [17].

Training

This editorial has described a complex trauma system. Training to work effectively within the system is achieved at many levels (Figure 6) and encompasses both individual skills and collective system rehearsal immediately prior to deployment (Figure 11) [18].

Training is also shaped by dynamic feedback from the operational environment via the weekly Joint Theatre Clinical Case Conference, a multi-disciplinary telephone conference linking all deployed UK field hospitals with the Royal Centre for Defence Medicine and the DMS Rehabilitation Centre [19].



Figure 11. Realistic, integrated end-to-end training. From top left the sequence of simulation is primary retrieval of live 'casualty' aboard MERT helicopter simulator; transfer from helicopter to land ambulance and land ambulance to wheeled stretcher outside ED; reception, assessment and resuscitation in ED; transfer to OR and simulated operation; real time request and consumption of simulated blood products, using blood warming devices; real time casualty administration, patient tracking and notification procedures; packaging and transfer out of hospital by intensive care team (Critical Care Air Support Team).

Summary

There are significant differences between the civilian and military pre-hospital trauma systems relating to patient load, injury severity and the nature of the environment. This is reflected in differing clinical paradigm and treatment protocols.

There is opportunity, however, for the two systems to learn from each other, which is particularly relevant at the time the UK is actively engaging with defining the requirement for trauma centres and the re-configuration of civilian trauma systems.

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A COMMENTARY FROM CIVILIAN PRE-HOSPITAL CARE

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Changes in civilian trauma care in the UK invariably reflects, after some delay, advances and practice changes adopted by the military; good examples being the introduction of massive transfusion protocols and damage control surgery. The military influence in pre-hospital care is no exception where tourniquets and haemostatic dressings are now part of the pre-hospital doctors armamentarium.

The NCEPOD report Trauma – who cares? Raises considerable concern in relation to both policy and clinical care with less than 50% of patients receiving an acceptable overall standard of care. What are the features of the military system. . . undoubtedly the physician led MERT team delivering critical care to the scene and

a consultant based multispecialty receiving team.

How can the NHS play catch up? The new Trauma Czar, Keith Willett, a very welcome and able appointee has already stated his commitment to establishing trauma systems and integrated networks. This will embrace the concept of major trauma centres and appropriately trained consultants immediately available in the emergency department 24 hours a day. It will not mirror Bastion with all lead specialities having a consultant presence but there will be on site and available SpRs day and night and also a requirement that the on-call consultant is free from other commitments in the day time and available on site within 30 minutes at other times.

Civilian clinical practice should take note of the achievements within military pre-hospital care. The authors should be congratulated as two drivers and innovators for change which is now demonstrating unexpected survivors from critical injuries.

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MILITARY PRE-HOSPITAL CARE: WHY IS IT DIFFERENT? A COMMENTARY

I Greaves

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Introduction

The authors of this paper conclude that there are significant differences between civilian and military pre-hospital trauma care systems. They draw particular attention to patient load, injury severity and the nature of the environment, and comment that there are opportunities for both military and civilian systems to learn from each other. None of these statements are, in my view, in any way controversial.

The key difference between military and civilian practice, is as colonels Hodgetts and Mahoney so clearly demonstrate, the fact that military pre-hospital care is part of a seamless, integrated system. It is fair to say that exemplary pre-hospital care is recognised as a key component of the military trauma system in a way that is not yet accepted in civilian practice, despite the immense efforts of the Faculty of Pre-Hospital Care at the Royal College of Surgeons of Edinburgh and the British Association for Immediate Care (BASICS). In addition, because of the structure of the DMS, the implementation of change, although not necessarily easy is achievable through appropriate and careful staff work.

This acceptance of the key role of pre-hospital care and the publicity attached to MERT (or to be precise MERT- enhanced, the medical emergency response team carrying medical expertise) have presented the military both with opportunities and challenges. It is the role of the Military Faculty of Pre-hospital Care to respond to these.

It is also worth at this stage making some acknowledgment of what, as far as the Faculty is concerned, pre-hospital care is, and what it is not. The Faculty is not responsible for Role 1 primary care, although it will work closely with providers of this level of care. It does have a responsibility, however, for aspects of emergency care at all echelons, and will work extremely closely, by consensus, to contribute to improving this care. It is also not responsible for Critical Care Air Support Teams (CCAST) which remain an RAF lead responsibility. It is responsible for all “forward projected” specialist care, by whomsoever it is provided. Currently the most high profile provider of pre-hospital care is MERT, but although this is an important component of the Faculty (and subject to the MERT steering Group, a committee of the Faculty Board) it is not the only provider. The Faculty and its members are already working to improve equipment in paramedic trauma bergens, to develop generic pre-hospital clinical SOPs as well as developing a working group to address issues surrounding the provision of medical support to adventurous training, to give only three examples.

MERT – problems and opportunities

Whilst MERT remains in the opinions of some a controversial concept, I am quite open in my belief that at the very least it is a significant contribution to patient morale and to reducing morbidity. I also believe that doctor lead pre-hospital care in the military environment improves mortality although I accept that this cannot yet be proven beyond reasonable doubt. MERT has also received firm endorsement from within the DMS and entered the popular consciousness as a key service to our fighting troops. The plaudits it has received speak for themselves. Aside from its clinical benefits, however, as DCA responsible for pre-hospital care, I have been able to use it to drive equipment acquisition and to undertake a comprehensive review of clinical protocols and training issues. We can, and do, use MERT in developing the use of equipment (such as bleeding warming devices) and protocols, which if successful can then be applied more widely.

However, it must be remembered that there have been problems. At one time, there were significant issues with what was described by one senior clinician as “trauma tourism” and there have undoubtedly been occasions when MERT doctors have lacked appropriate special to role training. The first of these issues has been addressed with the establishment of two MERT lines (one from anaesthetics the other from emergency medicine) and the second is being carefully considered by a committee of the Military Faculty.

There is no doubt in my mind that all those who have taken part in MERT can be immensely proud of what they have achieved. What we have to concentrate on now is ensuring that MERT is seen as a key component, but nevertheless only a component of the provision of military pre-hospital care. Whilst MERT has undoubtedly demonstrated its appropriateness for the war in Afghanistan, what is often referred to in planning circles as “the war”, what the Faculty has to ensure is that we can in the future deliver pre-hospital care for “a war”, wherever it might be fought. In these circumstances, pre-hospital care may have to be delivered by sea, on foot or in vehicles. It should also be remembered that even on Op HERRICK, MERT is only a component of the integrated system so ably described by the authors of the paper.

In addition, the impact of the arrival of US medical air assets in Helmand Province has yet to be definitively assessed. The evidence to date suggests that there will be a significant reduction in MERT activity. We must be careful therefore, not to put all our pre-hospital eggs in the one MERT basket.

The Challenges for The Faculty of Military Pre-hospital Care

Whilst there is no doubt that the provision of optimal equipment, or the introduction of new technologies, is a vital component of the work of the Faculty, I believe that its greatest challenge is the development of a sub-specialist appropriately trained cadre. As chairman of the Faculty I am spending much

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of my time working towards this end so that we will eventually have in place a cadre of committed pre-hospital clinicians. This work involves the development of paramedics across all three services, but equally important is the establishment of a medical cadre. This will, inevitably most involve specialists from anaesthetics, emergency medicine and general practice although there will be room for clinicians from other disciplines as long as training requirements and ongoing clinical practice can be achieved. What we are working to establish is a training scheme for these individuals which will prepare them for their operational roles and mirror the work of the Intercollegiate Board which is currently working on the standards required for recognition as a registered sub-specialist in pre-hospital care. This training pathway will undoubtedly be different in each "base" speciality, but the current work towards establishing a two year specialist programme for general practitioners is immensely exciting.

Further work needs to be undertaken, as described in the paper to establish the skill set for all pre-hospital clinicians. The Faculty will be able to, and will, establish standard clinical protocols. Trials of new equipment will be formalised and subject to review before introduction for clinical assessment.

In addition, the Faculty has already recommended that those who undertake pre-hospital care on deployment as a consultant will be required to have pre-hospital sessions in their NHS job plans. It is our intention, as soon as possible to determine minimum training requirements for doctors and to build into this programme pre-deployment training which is specific to the operational theatre rather than teaching pre-hospital care skills.

As a step in the development of a cadre with its own ethos, the first Tri-Service Pre-Hospital Care Conference will take place this year at Gosport on the 28th – 30th September. Further details can be obtained by contacting milphec@aol.com. In addition, an academic centre for pre-hospital care has been established on Teesside, based at James Cook University Hospital.

Moving towards the Future

In establishing effective training programmes for pre-hospital care (not to mention ongoing CPD) as well as developing a specialist cadre, the DMS will be attempting to achieve what the civilian pre-hospital care world has not yet managed in twenty years, although there are at last signs that such developments will be achieved. It is important therefore that we do not rush into actions which later turn out to be unwise. What we must achieve as a Faculty is a truly tri-service multispecialty, multidisciplinary approach with the ultimate aim that pre-hospital care takes its place alongside all the other "mainstream" specialities. We are still some distance from this. Although it is obviously easier to effect change in an organisation like the DMS, rather than the NHS, the difficulties of achieving consensus across three services should not be underestimated.

On order to establish properly regulated pre-hospital care the Faculty will also have to establish effective clinical governance systems. This is beginning to happen. Problems may be reported direct to me by clinicians or issues may be raised through the Joint Theatre Clinical Case Conference. In addition, ADMEM is making strenuous efforts to improve pre-hospital data capture.

Conclusion

The establishment by Surgeon General of the Military Faculty of Pre-Hospital Care has provided the specialty with the recognition it need to move towards the establishment of a (sub-)specialist cadre with defined training paths, established CPD and requirements for ongoing experience. Working closely with AMSTC, ADMEM, the individual services and civilian agencies will allow us to develop the specialty as a key integrated part of the continuum of care described by Hodgetts and Mahoney. The nature of the Defence Medical Services will then allow us to respond effectively and relatively rapidly to the best of developments in civilian pre-hospital care, whilst an increasing number of placements with civilian pre-hospital care providers will allow us to continue to bring our skills to the sick and injured in the UK. The future is enormously exciting and I find myself unusually optimistic about military pre-hospital care. No one should be under any illusions, however, there is a lot to be done and a long way to go.