

**Focus On....Managing Health Services Support to Military Operations.**

**Deployed Hospital Care**

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## **Abstract**

This is the sixth in a series of monographs that examine some of the principles and factors involved in managing health services support to military operations. The fourth and fifth papers discussed medical evacuation concepts and planning. The next paper the execution of medical operations. This paper will discuss the organisational developments in hospital support to expeditionary military operations – Deployed Hospital Care (DHC). It considers the predictions made in the final paper of the series on the evolution of casualty evacuation in the 20<sup>th</sup> Century published in the Journal of the Royal Army Medical Corps. The main body of the paper considers the evolution in deployed hospital care arising from operations in Iraq and Afghanistan and the limitations of current doctrine. It highlights the transition from deployable infrastructure to fixed infrastructure for medical units as a critical aspect of the adaptation from intervention operations to enduring operations. The paper closes by considering some of the emerging issues in the management of personnel within DHC units. The next paper will consider Continuous Improvement in Healthcare Support on Operations and how this complements the clinical joint theatre trauma governance system.

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## **Introduction**

This is the sixth in a series of occasional papers that examine some of the principles and factors involved in managing health services support to military operations. The fourth and fifth papers discussed medical evacuation concepts and planning. The sixth discussed the execution of medical operations. This paper will discuss the organisational developments in hospital support to expeditionary military operations – Deployed Hospital Care. It will open by considering the predictions made in the final paper of the series on the evolution of casualty evacuation in the 20<sup>th</sup> Century published in the Journal of the Royal Army Medical Corps. The main body will start by considering the current definitions in use to describe hospital capability. It will then consider the evolution in deployed hospital care arising from operations in Iraq and Afghanistan and the limitations of current doctrine. This will highlight the transition from deployable infrastructure to fixed infrastructure for medical units as a critical aspect of the adaptation from intervention operations to enduring operations. The paper will close by considering some of the emerging issues in the management of personnel within DHC units. The next paper will consider Continuous Improvement in Healthcare Support on Operations and how this complements the clinical joint theatre trauma governance system (1).

## **Review of Contemporary Operations**

The series of papers in the Journal of the Royal Army Medical Corps that reviewed casualty evacuation in the twentieth century described the challenge in balancing deployable hospital capability (DHC) close to the point of injury with the need for a stable, fixed environment to provide high level hospital care for casualties. The structure of the forward hospital, the casualty clearing station, went through a number of evolutions until the term was abandoned in the late 1970s in favour of field and general hospitals (2). The organisation of hospital support to UK forces further changed during the 1990s as the British Army shifted from being a threat-based (against the Warsaw Pact) organisation to a capability-based organisation (designed for expeditionary operations in a range of military scenarios). Operations in the Balkans, and more recently Iraq and Afghanistan have demonstrated the need for DHC to have both an expeditionary capability to support intervention operations and an enduring capability to support continuing operations.

The 1990s could be considered as the decade in which the Army deployable field hospital capability transformed from an austere, Cold War, high volume system to a expeditionary hospital system capable of providing medical care as close as possible to NHS standards. This transformation started with the introduction of containerised surgical systems manufactured by first GIAT and then Marshalls that provided a high quality clinical environment (2, 3). This innovational energy then moved to the emergency department with the introduction of new organisational structures and equipment (4). The new deployable hospital system was developed during 1999-2001 and was proved on Exercise SAIF SERREA in 2001. This had a fully climate controlled clinical environment across the hospital and incorporated all of the emerging innovations from the emergency department, operating theatres, intensive

care, laboratory and ward departments (5). This exercise demonstrated all of the hospital configurations described in the paper on hospital design published in this journal (3). These ideas led to the concept of the forward surgical hospital (FSH) and the evacuation hospital described in a previous paper (6). The FSH had two potential tasks, either: to deploy tactically to provide life and limb saving surgery for those casualties who would suffer from delay in further evacuation; or to deploy strategically to provide initial surgery for cases prior to evacuation from theatre. The evacuation hospital would provide primary surgery and preparation for strategic evacuation if the theatre was sufficiently large to require more than one echelon of DHC.

Operation TELIC was the next phase in UK expeditionary hospital development. After the initial warfighting phase, UK hospital support consolidated into a hospital on the Shaibah site based on the Exercise SAIF SERREA design. This persisted until the move of UK forces onto Basrah airbase and the build of a hard-walled infrastructure hospital. Hospital capability was extended to include a CT scanner with telemedicine 'reach-back' to the UK. The organisation of medical support to the deployment of UK forces to Helmand province in Afghanistan in 2006 followed a similar pattern with the initial establishment of a 'SAIF SERREA' design hospital and then a move into a fixed, hard-walled hospital.

Over the past decade, the UK DMS has substantially improved its DHC medical shelter systems incorporating climate control (heating and air-conditioning) and deployable container systems. The requirement for enduring hospital infrastructure has led to the introduction of civilian contractors into the procurement and

management of military medical facilities. As examples, G3 systems installed and maintain a CT scanner with satellite telemedicine support in Shaibah logistics base in Iraq (7) and Midland Medical Systems has provided medical gas pipeline systems (8). For Op HERRICK in Afghanistan, it was planned at the outset of the deployment that the tented hospital would be replaced by a specially procured hard-walled fixed hospital in Camp Bastion and G3 systems was contracted in 2006 to design, establish and manage this facility (9). A review of hospital care in the ISAF mission in Afghanistan described the same evolution in DHC infrastructure on a multi-national basis with many nations and also NATO investing in enduring hard-walled, fixed hospital infrastructure in the enduring military operating bases (10). Essentially the UK DHC concept for OP HERRICK illustrates the transition from an expeditionary forward surgical hospital to an enduring evacuation hospital.

The casualty estimation paper of this series on medical planning has described the extension of the military Population at Risk (PAR) to include multinational partners, indigenous security forces, local civilians and detainees. Each of these groups has subtly different clinical needs that need to be matched with clinical equipment and personnel within the military hospital. Clinical care within the DHC, especially resuscitation has continued to develop with innovations such as recombinant Factor VII (11), massive blood transfusion (12), platelet transfusion and ‘resuscitation’ CT scanning becoming standard practice.

### **Medical Treatment Facilities: Definitions and Limitations**

The basic organisational structure (clinical services, command, administrative support

and accommodation) proposed for a generic field hospital described in a previous paper remains valid (3). Many of the support functions previously provided by military resources have become contracted such as infrastructure construction, facilities maintenance and life support services (accommodation, feeding, laundry). The asymmetric battlefield has drawn medical units inside protected military bases rather than being sited separately from military units, relying on the Red Cross for protection. The increased use of helicopters and fixed wing aircraft for medical evacuation has resulted in hospitals being sited close to helicopter landing sites and runways. This has led to a much closer association between Land Component DHC units and Air Component aeromedical staging units (ASU) with the ASU function increasingly being drawn into the hospital complex and patients being directly transferred from hospital beds to aeroplanes.

The DHC concept is based upon the NATO definitions for deployed hospital capability that are shown below:

Role 2 Light Manoeuvre (R2(LM)): light, highly mobile Medical Treatment Facilities (MTF) with the following capabilities: specialist medical officer led resuscitation, damage control surgery with post-operative care, field laboratory, basis imaging, reception, regulation, evacuation, limited holding.

Role 2 Enhanced (R2E): small field hospitals; Role 2(LM) plus primary surgery, surgical and medical intensive care, nursed beds, enhanced field laboratory, casualty decontamination.

Role 3 (R3): theatre secondary health care possibly including: specialist surgery (neurosurgery, maxillo-facial surgery, burns), advanced and specialist diagnostic capabilities (CT scan, arthroscopy, sophisticated lab tests), major medical specialities (internal medicine, neurology, intensive care, ophthalmology).

Nations develop medical units to support national concepts of military and medical operations. Although these NATO capability descriptions are helpful, it is necessary to understand national organisational concepts in order to compare medical units with the same capability definitions. As an example, the US Army R2 (LM) is a Forward Surgical Team which has no declared ICU capability (13) that co-locates with an Area Support Medical Company, the US Marine Corps concept is based on a combined unit formed from a Forward Resuscitative Surgical System and a Shock Trauma Platoon (14), the US Air Force organisation is based the escalatory Expeditionary Medical System (EMEDs) (15), and the UK capability is based in a combination of a Medical Reception Station element from a Medical Regiment and Field Surgical Teams from field hospitals or a small element from a Field Hospital. Each of these is different in total manpower, capacity and capability and reinforces the requirement to ‘mission tailor’ units to the specific requirements of actual operations.

The separation between R2(LM) and R2E has been a point of discussion in recent operations in Iraq and Afghanistan. Once a Role 2 (LM) has gone firm and become incorporated into the deployed hospital care network it ceases to function in the ‘light manoeuvre’ role. There is then a debate over the minimum capability required to justify the R2E designation. The ‘E’ label certainly implies an ICU capability which



must be supported by oxygen, a climate controlled environment, suitable beds and appropriate diagnostic support. This seems to fit the capability description of the forward surgical hospital explained in a previous paper (3). The introduction of CT scan capability into deployed field hospitals has also raised the debate over the R2E/R3 definition. This imaging modality is increasingly considered to be the standard of care for severe trauma patients and so is an essential component of primary surgery. Therefore CT scan should be considered as an essential capability descriptor to be included against the NATO MTF definition. Thus a R2E with CT can be surged to a R3 with additional clinical capability so long as the infrastructure is suitable.

### **Expeditionary Infrastructure for Medical Units**

The ground and climate in both Iraq and Afghanistan have proven the requirement to have robust, expeditionary hospital infrastructure. The paper on reconnaissance for field hospitals (16) introduced the need for close co-operation between the medical and engineering staff to undertake the essential groundwork prior to the construction of deployable hospitals. This has been further emphasised and extended in recent operations to the need to work closely with civilian contractors in the procurement and design of such facilities. There are a wide range of procurement options from bespoke containerised systems, modular temporary accommodation to permanent conventional construction.

There have been a number of innovations in the design of the clinical complex for deployed hospitals since the paper on design of field hospitals was published (3). The

first concerns the relationship between deployed hospital care and primary care. Both capabilities will be required to support the population of the operating base in which the hospital is located. If both capabilities are small, it may be most efficient to co-locate them so that the primary care team can reinforce the hospital staff in the event of a major incident. If the facilities need to be large because of the size of the dependant population, it may be preferable to separate them in order to avoid primary care patients congesting the emergency department. If the capabilities are co-located in order to achieve efficiencies in medical infrastructure, it may be preferable to have separate entrances to the same building. This same debate also applies to the 'bedding down' function of primary care, this can either be in a separate primary care facility or in the deployed hospital. It is important not to forget this requirement as it is a significant element of enabling the minor sick and injured to return to units – the 'conservation of the fighting force' function.

The design of field hospitals has been constrained by the physical dimensions of military tentage systems. Once a decision has been made to use pre-fabricated or conventional buildings, the hospital design becomes more flexible. This allows more freedom to link the emergency department to the surgical department, imaging department and laboratory. The design should allow 'right turn' (or other direction!) resuscitation in which a very seriously injured casualty can be taken directly to the operating theatre to allow concurrent surgery and resuscitation. The design should also allow easy movement of patients by trolley to the CT scanner. The move to higher specification shelter systems also allows the introduction of climate control, water and sewage circuits, piped gases, pressurised air flow and flood wiring. Each improvement in shared services potentially improves patient care but carries the

overhead of increased maintenance and cost, and also the increased risk of catastrophic failure of the hospital infrastructure. It is also important to consider the long-term future of this facility, especially the durability and the suitability of the technology, if the facility is to be handed to the indigenous government at the completion of the military operation. The design should allow for expansion of critical areas in the future as it is almost certain that the population at risk dependant on the hospital is likely to change (up or down). Finally it is essential to have a reserve, 'resilience' plan to relocate the hospital function in the event of significant damage to the hospital (from fire, indirect fire or other major systems failure). This may be in another medical space or in a designated alternative space such as a gymnasium or dining facility.

### **Managing Personnel within Deployed Hospital Units**

The paper on command in field hospitals described some of the leadership and cultural changes that are unique to deployed hospital facilities compared to both the conventional military and healthcare sectors (17). Current UK military medical doctrine considers the pool of deployable manpower being formed of 3 groups: Regular (full-time) personnel, Reserve (civilians who have volunteered to be available for deployment as military personnel) and civilians (who remain non-military with no liability to carry arms and with restrictions on exposure to risk). The endemic shortage of uniformed Regular manpower (especially hospital staff) has transferred the risk of a shortfall in medical personnel for military operations to the Territorial Army both as individual augmentees and formed units. Indeed the Territorial Army has met 50% of the military medical manpower requirements since 2003 (18). The UK has also hosted

multi-national medical staff in the field hospitals in Iraq and Afghanistan. As a further mitigation of the shortage of uniformed medical manpower, a civilian company, Frontier Medical, was contracted to provide civilian medical personnel as augmentation to the UK military field hospital in Iraq (19). Whilst this has reduced the demand for specialist personnel from the Regular forces, these contractors were limited to employment within the Basra Contingency Operating Base (COB) which reduce the number of available clinical escorts to move patients to other medical facilities in Iraq. They also have the right to leave at any time, which can cause difficulties if the security situation deteriorates (20). As previously described, contractors can also be used to manage infrastructure support – possibly extending to internal hospital services such as central sterile supplies or pharmacy.

Given the historical evidence, it may continue to be difficult for the Regular component of Western military medical services to achieve full manning in the foreseeable future. Thus military medical services will continue to use the whole range of solutions currently needed to generate medical manpower by seeking to utilise the whole national and multi-national health economy. Table 2 summarises the benefits and risks of the range of options for providing medical personnel to support military operations.

Table 2 Range of Personnel Employment Options for Military Medical Services for Operations

Type of Employment	Regular Forces	Reserve Forces	Multi-national military forces	Civilians employed as Civil Servants	Civilian contractors
Benefits	Guaranteed	Costs only a	No direct costs	Only incurs costs	Only incurs costs

	readiness and liability. Available for full military training. Available to provide health care to eligible PAR. Right to carry arms.	retention payment only when not mobilised. Subject to military law when mobilised. Right to carry arms.	(normally). Under military law (national). Right to carry arms.	when deployed. Understand national practice of medicine. Wide pool of potential volunteers. May not carry arms.	when deployed. Limited pool of potential volunteers. May not carry arms.
Risks	Total costs lie to Armed Forces (professional training, benefits etc)	Limited liability. Requires formal mobilisation. Requires compensation for loss of earnings. Limited depth of military training.	Failure of clinical integration. Failure of sending nation to honour commitment.	Failure of military integration. Right to depart operation. No military training. Limited scope for employment across theatre.	Failure of military integration. Agency overhead costs. Right to depart operation. No military training. Limited scope for employment across theatre.

The deploying hospital commander will have to pay careful attention to how he (she) decides to build and sustain the hospital team. This needs to be built into the unit training programme in addition to maintaining individual medical skills. The HOSPEX at the Army Medical Services Training Centre is an essential part of this process (21). The commander should also consider how he initially engages and inducts his team, confirms clinical, leadership and social competencies, and prepares them for aspects of clinical practice outside normal NHS practice (e.g. range of injuries, types of patients and cultural and social aspects of providing care for the indigenous population). It is also necessary to consider how to enable the re-distribution of clinical manpower between medical facilities within a theatre of operations in order to support a surge of operational activity. A previous paper describes how this was done in Afghanistan in 2006 (10). This was also done in 2010 to support operations in Central Helmand. Medical commanders need to consider how to integrate such an inflow of medical personnel who have not been through the same formative experiences as the in-place clinical team in order to increase clinical capacity without disrupting existing social structures. This also requires consistency in basic organisational structures and SOPs between AMS field hospital units.

Pre-deployment training of clinical staff for roles in deployed hospitals has also become much more structured with a shift in focus from the clinical skills of individuals to the function of clinical teams (22). This has been complemented by the formalisation of clinical activity into Clinical Guidelines for Operations (CGOs, 23) by the UK and US Joint Theatre Trauma System Clinical Practice Guidelines (24). These mirror the use of theatre clinical policies described in previous papers on the evolution of casualty evacuation (2,6). The complementary role of Hospital Standard Operating Procedures and CGOs needs some debate as there must be definite separation between procedural direction for predictable circumstances and guidelines that retain the professional autonomy of the clinician.

One of the most important innovations in the clinical leadership of deployed hospital units has been the formalisation of the role of the Deployed Medical Director (DMD) (17). This individual is responsible for clinical leadership and performance within the clinical complex and therefore needs both the gravitas and social skills to achieve this. This is a supporting role to the Commanding Officer who is responsible for the leadership and management of the whole hospital. The DMD also plays an important role in the acceptance of patients against the hospital's clinical workload and the planning of patient transfer from the hospital. The post is evolving into the clinical advisory function to support the medical commander that was described from previous large scale operations (25). The role complements that of Consultant Advisers who perform this function to the senior medical leadership in the home base. Indeed the US has now created a deployed Joint Theatre Trauma System Director to perform the clinical supervisory function on the staff of the theatre medical command.

Current operations have also shown how some aspects of hospital management should adjust in the transition from expeditionary DHC to enduring DHC. As an example, manning ratios in hospitals have been based on integrated clinical teams designed to cope with surges of activity. The organisation of enduring DHC capability should perhaps reflect civilian structures based on formal shift work across the whole hospital. As an example, the operating department might de-couple the relationships between surgeons, anaesthetists and theatre staff in manning tables and create separate rotas. This allows semi-elective surgery as well as surge, emergency, surgery. The complex nature of current military injuries (especially Improvised Explosive Devices) has also shown the need for multiple surgeons to operate on the same casualty. Thus our planning ratios might need be based upon the number of hours that a surgeon operates rather than the number of hours of surgery per patient.

## **Summary**

This paper has reviewed some of the organisational developments in Deployed Hospital Care supporting military operations. It has examined some of the limitations in current doctrine defining medical units. The transition from expeditionary to enduring DHC has led to a range of developments in DHC infrastructure and how this is managed. The paper has closed by discussing some of the issues regarding the management of personnel within DHC units. The next paper will consider systems of quality assurance for health services systems supporting military operations.

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