

# Training Tomorrow's Military Surgeons: Lessons From The Past And Challenges For The Future.

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## Abstract

The nature of conflict is evolving, with current warfare being associated with an initial "shock and awe" phase followed by protracted periods of counter-insurgency and peace support missions. As conflict has changed, so have the munitions deployed and the resulting patterns of injury. Improvised Explosive Devices have become the preferred weapon of the insurgent and the resultant explosive and fragmentation injuries are the hallmark of modern military wounding. These injuries pose a significant challenge to deployed medical forces, requiring a well-defined, seamless approach from injury to rehabilitation.

Traditionally, military medical services demonstrate a poor 'institutional memory' in the maintenance of combat surgical skills. Numerous publications detail the re-learning of key tenets of war surgery by generations of surgeons deploying onto the field of battle. While the maintenance of military surgical capability in trained surgeons may be addressed through combat surgical courses, concern exists as to the generic competency of those currently in training and their ability to deal with the burden of injury associated with modern conflict.

The training of junior doctors in the United Kingdom and further afield is in a state of flux. New curriculum development, streamlined and run-through training programmes have combined with the legal requirements of the European Working Time Directive to produce a training landscape almost unrecognisable with that of previous years.

This article investigates the development of current military wounding patterns and modern surgical training programmes. It describes processes already in place to address the unique training needs of military surgeons and proposes a framework for enabling appropriate training opportunities in the future.

## The Legacy and the learning of lessons

*"That men do not learn very much from the lessons of history is the most important of all the lessons history has to teach."* Aldous Huxley

Many of the advances in modern trauma care are inevitably linked to conflict. Pre-hospital transportation [1], the earliest descriptions of amputation [2] and the fundamentals of haemorrhage control [3] may all be in some part attributed to military surgeons and surgery.

Two World Wars have borne witness to a revolution in the care of injured service personnel. Fracture management evolved with the use of Hugh Owen Thomas' splint [4] and increased awareness of intramedullary fixation followed Wehrmacht surgeons' intervention with allied pilots [5]. Reconstructive surgery as a speciality evolved out of the devastation of the trenches and the experiences of Sir Harold Gillies amongst others [6]. Improvements in fracture care, the use of antibiotics and improvements in wound management in general have also had a significant effect on the expected mortality from military wounds [7]. The burden of significant hand trauma resulting from conflict led Sterling Bunnell to establish US Army Hand Centres after the Second World War. This innovation in casualty care was the driving force in the eventual establishment of Hand Surgery as a speciality [8].

Aside from these material gains in surgical technique and

organisation of casualty care, perhaps one of the greatest attributes of those surgeons serving in times of conflict is the assimilation of leadership skills ultimately benefiting civilian practice. This has been evident in both the North American and British Surgical fields [7,9].

Current conflicts continue to engage military surgeons in the care for victims of war: combatants, civilians and refugees. While munitions and their delivery systems may evolve, the principles of battlefield surgery remain largely unchanged. Military medical literature is populated by numerous articles detailing 'lessons learned' from conflicts. There is a skill set for war, perhaps a mindset difference that seems to be re-learned at the start of every conflict. On reflection this is perhaps more correctly interpreted as experiences forgotten and re-learned in austere circumstances.

This is evident from the Boer War [10] the First World War [11] the Second World War [12], the Suez crisis [13] and the Vietnam War [14]. The lessons available from these conflicts are lost in the training of junior surgeons and this is apparent in similar articles produced with the same message in more recent battles. These 'lessons' were being re-learned in the Falklands Conflict [15,16], Iraq [17] and currently in Afghanistan [18,19]. The legacy is apparent. The need for continuity in battlefield surgical experience in military surgeons is evident. So how though does the training of current junior military surgeons address the particular needs of the deployed surgeon?

## Surgical Training in the National Health Service.

For generations of doctors entering the surgical profession, acquisition of theoretical knowledge and assimilation of operative

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skills were based on an apprenticeship model [20] - the student learning from the "Master". Observation, supervision and experience were the basis of education and training in the art and skills of surgical practice. An acceptance of long working days and variable periods of rest were the norm. This apprenticeship was of indeterminate length and junior surgeons spent many years shouldering the vast majority of the surgical workload. Trainees gained a wealth of first hand experience, but evidence of knowledge and ability was anecdotal. References and reputation were the key to career progression.

In recent times, surgical training has seen a number of fundamental changes. Following the Calman report of 1993 [21], the postgraduate medical training landscape underwent considerable transformation. Reforms were needed to 'align' postgraduate training in medicine with other countries in the European Community. Each trainee was given a 'number' following competitive entry into their chosen speciality. Training was undertaken over a defined time period and the programme of training was planned to allow appropriate exposure for the trainee. Supervision and feedback to trainee and trainer was established.

Fundamental to the 'new' training programme was the concept that completion of training would be based on fitness to practice independently as deemed appropriate by the specialist bodies [22], yet within a limited timeframe. Following a period of integration these changes were deemed a success, mainly by those responsible for their implementation [23]. The ability to manage trainees' progression against published criteria and the establishment of a managed and flexible system for delivering training to standards set by the specialist bodies was celebrated by the establishment.

Parallel to these changes in training emerged concerns over trainee supervision and "out of hours" operating. Formalised in the first report of the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) in 1987 [24], concerns were raised in many areas including the pre-operative optimisation of patients undergoing surgery, expertise of those performing surgery and of supervision of junior surgeons. As a result of these enquiries there has been an advent of consultant led management of trauma cases [25] and recommendations for increased consultant led operating, trainee supervision and dedicated emergency operative resources [26]. Operating at night and during weekends became formalised and was discouraged for all but the most urgent cases. Opportunity for exposure to cases thus declined.

"Calmanisation" thus placed a limit on time in training. NCEPOD further limited the amount of trauma emergency operating available to junior surgeons during that limited training time. Reaction to these changes was mixed. Some welcomed the change and claimed improvements in training and patient care [27,28], although on review of the literature, they were somewhat outnumbered by those citing negative aspects of the alteration in specialist training across many specialties [29-39].

In terms of trauma training in particular, concerns over the volume of cases experienced by trainees both in the United Kingdom [40] and elsewhere [41-43] have been expressed. The growing anecdotal concern over the training of trauma surgeons of the future [44] encompasses all specialties, is a worldwide issue and has led to calls for close attention to the structuring of trauma care and the training of its protagonists [45].

The concerns of surgeons, trainees and their patients regarding changes in the training environment are therefore apparent; however a further change is occurring that will further challenge surgical trainees. In August 2009, junior doctors became fully compliant with the European Working Time Directive and the 48 hour working week. This has already been received with concern by both the profession and the popular press [46].

This stricter regulation of working hours with the full implementation of the 48 hour week and haphazard selection of junior doctors with the Modernising Medical Careers initiative [47] have only served to highlight existing concerns regarding the inadequacies of a modern training programme. This is put in

context by experiences of orthopaedic trainees in the United States. In assessment of changes in operative experience engendered by adoption of an '80 hour week' it was shown that the learning curve is prolonged with trainees performing 20% less cases [48]. Noting that this occurred with a 'reduction to 80 hours', it can only be concluded that a significant reduction to 48 hours will curtail experience even further with a considerable lengthening of the learning curve!

However, regardless of concerns voiced, the changes are in place. Decreased operative experience for junior surgeons is a reality. There has been a change in training emphasis, away from experiential learning toward focused education. Practical courses, workshops and simulators have been developed to 'bridge the gap' between competence and experience [49-54]. Curricula have been developed to guide training and establish competency. There are objective assessments of both knowledge and practical skills, with sub-speciality exit examinations, in training assessments, validated logbooks and procedure based assessments [55]. It therefore remains to be seen in terms of civilian specialist registrar training where the short fall between loss of experience and improvements in focused training occurs.

## The military surgical trainee

Mirroring the changes in medical post-graduate training have been a number of alterations in the structure of military medical care in the United Kingdom Armed Forces over the last twenty years. Secondary care has been re-structured with a single focus of the Royal Centre for Defence Medicine in Birmingham and satellite facilities (Ministry of Defence Hospital Units) attached to National Health Service hospitals. UK military hospitals have all closed. Military consultants and doctors in training began working and training alongside civilian clinicians, treating primarily civilian patients whilst maintaining responsibility for the care of service personnel. Whilst overseen by the Defence Postgraduate Medical Deanery, the practical training experience of military surgeons is in parallel to civilian training schemes. The inference is that following completion of training, military and civilian trainees will be on a par - both groups taught and tested on purely civilian skills.

The demands placed on deployed military surgeons however are far removed from that expected of their civilian counterparts. Aside from the austerity, logistical restrictions, climatic challenges and the stress associated with surgical provision to troops in combat, the nature of casualties of war are unique. This situation has been highlighted in the popular press of late due to an increased operational tempo in Afghanistan [56]. The wounds of war are seldom encountered in civilian surgical training. There is a lack of confidence and perceived inadequacies in training amongst current orthopaedic trainees in the management of significant musculoskeletal trauma - situations including exanguinating junctional injury, the mutilated hand, amputation and resuscitation with blood products [57].

The distinction of military surgery has been addressed on a number of levels in the recent past as those involved both in surgical support to the armed forces and the co-ordination of military surgical training have adapted to both the current pattern of conflict injury and the overall training environment. The practice of military surgery is a distinct entity. It requires individuals to sustain periods of high states of readiness and a capacity to manage an injury burden uncommon in civilian practice. These elements that identify the modern military surgeon have been highlighted by the current Defence Professor of Surgery [58].

The need for a team approach that is all encompassing in the resuscitative surgery of conflict casualties including the anticipatory treatment of trauma coagulopathy and time limited surgery is apparent. The ability to control haemorrhage is paramount. Access to proximal control by way of familiarity to approaches of the groin

and axilla are highlighted. Military Damage Control Orthopaedic Surgery has been defined as a skill-set. Rapid arrest of extremity and junctional haemorrhage, proficient temporising fracture control with exemplary debridement skills and proficiency in fasciotomy are mandatory.

The lack of volume of penetrating trauma seen in the United Kingdom is highlighted as insufficient for those involved in military surgery to gain proficiency and retain skills in deployed trauma surgery. It is recommended that additional training in extremity, junctional, pelvic and torso trauma are available to trainees in terms of defined courses and attachments to high volume trauma centres [18,59-61].

The identification of military surgery as a distinct entity is mirrored in the needs of military trainees being distinct from their civilian peers. The trainee in a National Health Service hospital does not transform into a deployable surgeon on completion of training. The process is gradual and occurs throughout higher specialist training, to enable as seamless a transition as possible to independent military practice. To enable this to occur, a training pathway exists within the Defence Medical Services to aid trainees in their preparation for completion of training [62].

The challenges to civilian surgical trainees may be transparent and of concern. The need for appropriate training for their uniformed peers progressing into a defined speciality with particular educational and operative needs is all the more compelling. Military surgical trainees are training in a civilian system already causing concern for its ability to ensure basic competence. Having defined military surgery and described the particular requirements of those engaged in war surgery it remains to ask what more can be done to meet the needs of military trainees. There is no single panacea for the concerning lack of surgical exposure to be found within the National Health Service. As previously identified, the answers lie out with current United Kingdom training programmes and mandatory courses.

### ***Supervised periods of deployment***

These are now established practice within the orthopaedic training cadre and offer trainees a vital opportunity to experience the workings of a field hospital and an exposure to wounds of war. The subtleties of the strain placed on an individual deployed away from home comforts may be appreciated without the added concerns of independent practice coupled with unrivalled opportunities to learn from experienced surgeons, which will in itself negate the negative effects of loss of 'military surgical institutional memory'. By 'building in' deployable time into training programmes, those achieving competency in training will have had the opportunity for at least two periods of operational experience prior to adopting the consultant role. This requires an element of understanding between the specialist bodies and regional training advisors – the benefits however are obvious.

### ***Hospital Exercises (HOSPEX)***

This is the 'dress rehearsal' of combat casualty care for both individuals and formed units, where simulated casualty exercises are conducted in a 'mock up' field hospital in the UK. Using realistic casualty simulation in real time resuscitation scenarios it allows both individuals and the 'system' an opportunity to exercise body and mind prior to deployment. As alluded to above, the team approach is paramount in military surgery and this is illustrated during these exercises. HOSPEX also allows clinicians drawn from throughout the United Kingdom to meet and establish familiarity prior to deployment. Participating in HOSPEX, particularly as part of preparation for a supervised deployment will benefit military trainees.

### ***"Non-Mainstream" courses***

While a number of course are either mandatory or highly recommended throughout surgical training, there are other courses that are of particular use to the military trainee. These are in

addition to those of civilian surgeons in training and this must be reflected in the training budget. Certain overseas exercises are of significant benefit to both the trained and the trainee military surgeon. They present a valuable opportunity to experience trauma operating in professionally run facilities, as well as once more an opportunity to establish relationships in the deployed team. In an age of the disappearing apprentice model in surgery, the one-to-one nature of training available on courses such as these and supervised deployment is without equal.

In addition to these, small group cadaver based trauma courses are available to the trainee in particular through the Definitive Surgical Trauma Skills course and Amputation provided by the Royal College of Surgeons of England. More recently from the same institution and Academic Department of Military Surgery and Trauma (ADMST), there has been established a five day Military Operational Surgical Training (MOST) course. With a faculty of experienced military surgeons, this course allows small groups of surgeons and trainees to discuss and practice the operative skills peculiar to the management of conflict injury. As well as extremity and torso trauma, maxillo-facial, ophthalmological and neurosurgical cases and skill sets are discussed. A fully mocked up operating theatre allows for realistic DCR/DCS scenario teaching.

Courses on the principles of War Surgery, neurosurgery and the mangled extremity are also available annually through the Royal Centre for Defence Medicine and are similarly encouraged. Cooperation between trainee, host NHS hospital and the budget holders of educational and subsistence funds is required to ensure that training is both appropriate and timely.

### ***Fellowships***

Traditionally the accepted means whereby trainees assimilated skills pertinent to their sub-specialist role, the fellowship is currently threatened by budgetary control. It is established that NHS practice affords neither the trained nor the untrained military surgeon the chance to attain and more importantly retain the skills necessary to perform in the deployed role. Attachment to high volume centres has been encouraged. This however almost certainly will require an attachment away from the home base of the trainee. It remains an area of negotiation requiring a strong business case to ensure funding and academic approval are granted. These measures both in isolation but preferably in combination will help prepare the trainee for military surgery in the consultant's role.

### ***Summary***

Military surgeons have driven the advancement of the surgical specialities out of experiences on the fields of battle. Surgeons practicing in times of conflict are responsible for a considerable number of key innovations in trauma surgery. Whilst their legacy is apparent, concern exists over the preparedness of the next generation of military surgeons partly as a result of diminishing opportunities in which they may gain the day to day operative experience of their distant and more recent predecessors.

In this article factors responsible for the path leading to the current training situation have been illuminated. The distinct requirements of military surgeons have been highlighted and an appreciation of awareness from within the service of the needs of their surgeons, both trained and untrained is demonstrated. A tentative route to aid those following in the footsteps of their hugely experienced consultant colleagues is suggested.

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