Now and Then: Combat Casualty Care Policies for Operation Iraqi Freedom and Operation Enduring Freedom Compared With Those of Vietnam

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Between December 2004 and Jun 2007, 13 key Operation Iraqi Freedom/ Operation Enduring Freedom combat casualty care policies were published to inform medical practice in the combat theater of operations. Published policies were authored by the 44th Medical Command (1), the Office of The Army Surgeon General (11), and the Office of the Assistant Secretary of Defense (Health Affairs) (1). These policies, published as an All Army Action message (and/or in memorandum format signed by The Army Surgeon General), were compared with published medical newsletters and medical bulletins issued during the Vietnam War era, beginning in 1966. Common to both wartime eras was the recognition that the presence of a medical research team in theater was a critical element to ensure accurate data capture for subsequent analysis, to document lessons learned, and to study the impact of new wounding mechanisms, whether it be the Pungi sticks and mines of Vietnam or the types of explosions specific to Operation Iraqi Freedom/Operation Enduring Freedom. It is important to recognize that both then and now, medical practice has been a reflection of the current state of medical practice, and that in both conflicts military medical personnel have been equally devoted to saving lives of combat casualties.

Key Words: **Global War on Terrorism, Policy, Office of The Army Surgeon General, Health Policy and Services.**

J Trauma. 2008;64:S14–S20.

Since the beginning of the war in Afghanistan and Iraq, The Office of The Army Surgeon General (OTSG), Health Policy and Services (HP&S) Directorate, has had the responsibility to write medical policy for the Combatant Commands and to assist in writing policy for medical care provided in the combat theater. Because Operation Desert Storm/Desert Shield was a short-lived conflict, few new medical policies arose from clinical experience in that war. The sustained Global War on Terrorism, however, has generated large numbers of casualties and has served as the basis for comparing current policy writing to that from the Vietnam War. Of course, care for trauma patients has evolved substantially in the past 40 years and new policies take advantage of a variety of advances in civilian trauma medicine.[1,2] Changes in medicine have occurred in numerous domains of critical importance to the military, to include preventive medicine (e.g., immunizations), improved training, storage and use of blood products, diagnostic capability, damage control surgery, and availability of sophisticated critical care capabilities during flight, to name a few. This article compares current combat theater policies with information provided to medical personnel in Vietnam.[3–15] Some Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) policies leverage advanced technology, some are refined versions of known interventions (e.g., tourniquet type and use), some are based on knowledge from civilian trauma patients (deep vein thrombosis [DVT] risk), and some are based on new threats inherent to the Global War on Terror (e.g., Actionable Medical Intelligence). In writing this article, no judgment is made about Vietnam War medical policy, and it is written with the utmost respect and admiration for those medical personnel who provided superlative care to wounded casualties so many years ago and who taught many of us their lessons.

POLICIES

Antithrombotic Therapy for the Prevention and Treatment of Thrombosis

On 25 December 2004, the 44th US Army Medical Command, XVIII Airborne Corps, published a policy entitled "Antithrombotic Therapy for the Prevention and Treatment of Thrombosis". This policy recognized that proximal DVT occurs frequently in hospitalized patients and that combat casualties with multiple injuries were at particularly high risk.[16,17] It also acknowledged that extended aircraft travel, such as occurs when casualties are medically evacuated in a 6-hour to 8-hour flight from Balad, Iraq, to Landstuhl, Germany may also increase the risk for thromboembolic events. The policy was influenced by concerns about the reported incidence of thromboembolic events among injured patients arriving in Germany and at Walter Reed Army Medical Center. Al-

Submitted for publication October 30, 2007.
Accepted for publication October 30, 2007.

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DOI: 10.1097/TA.0b013e31816093bd

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
OCT 2007		**00-00-2007 to 00-00-2007**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Now and Then: Combat Casualty Care Policies for Operation Iraqi Freedom and Operation Enduring Freedom Compared With Those of Vietnam	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **U.S. Army Institute of Surgical Research (USAISR),3400 Rawley E. Chambers Avenue,Fort Sam Houston ,TX,78234-6315**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**7**	

though this is a concern, recent data from Chung et al. have shown that for burn casualties, no increased risk is incurred by the prolonged medical evacuation.[18] The policy recommended use of low molecular weight heparin (LMWH) and intermittent pneumatic compression for emergency trauma surgery patients, with consideration for higher doses of LMWH and possibly placement of inferior vena cava filters in very high risk patients and patients with contraindications to heparin such as intracranial hemorrhage, significant solid organ injury, etc. This important policy made routine the use of DVT prophylaxis in Iraq and positively impacted the incidence of clotting events at medical facilities along the evacuation chain. There was no equivalent or comparative policy from Vietnam. This is not surprising as LMWHs, intermittent pneumatic compression devices, and modern inferior vena cava (IVC) filters were not available. Although there was recognition that clotting events could occur in surgical patients, these techniques to prevent blood clots were not part of routine civilian practice and were not practiced in Vietnam.

Individual Soldier Tourniquets—Combat Application Tourniquet (CAT)

In March 2005, OTSG, HP&S Directorate forwarded an All Army Action message (ALARACT) entitled "Individual Soldier Tourniquets—Combat Application Tourniquet". This policy addressed the high frequency of traumatic limb injuries, caused most often by explosions. It specified and approved (by brand name) the deployment of two tourniquets for use in combat. Before this time, combat units could requisition multiple types of tourniquets and choices reflected the preferences of medical officers in that unit. The policy standardized which tourniquets could be requisitioned and did so based on a strong recommendation derived from the comparative study by the US Army Institute of Surgical Research (USAISR).[19,20] These data demonstrated which tourniquets were and were not highly effective, i.e., able to stop arterial bleeding in upper and lower extremities. Tourniquets varied in effectiveness from completely ineffective to 100% effective. Large numbers of tourniquets were rapidly pushed into both OIF and OEF theaters following this policy and tracked until enough were available in theater so that every service member (not only Army) could carry a dedicated and highly effective tourniquet. As of September 1, 2006, the CAT tourniquet became a component of the Improved First Aid Kit issued to all soldiers. This policy did away with the traditional cravat and stick approach. With greater attention to tourniquet use, training for all soldiers in appropriate use was tantamount, weighing the lifesaving potential after severe extremity injury against the risk of limb loss with prolonged application. Kragh and Beekley in separate articles in this *J Trauma* supplement describe the safety profile of these new tourniquets, and the risk-to-benefit ratio comes down clearly on the side of tourniquet use. In addition, combat deaths caused by isolated extremity injuries (amenable to tourniquet application) can be tracked. Although always dependent on the tactical situation, timely application of an effective tourniquet should minimize the risk of death caused by bleeding from isolated extremity injuries. Tourniquets have been in use for hundreds of years, of course,[21] and were in use in Vietnam, but today's policy appears to differ drastically from the Vietnam era policy that discouraged tourniquet use because of potential limb loss. Policy developed for OIF/OEF brought to light the fact that some tourniquets were more effective than others and pushed equipping every soldier with effective tourniquets. One of the more important initiatives was to remove ineffective tourniquets from the logistics chain. The widespread and near universal adoption of prehospital tourniquet use is likely the single most important prehospital medical intervention to come from this war.

Individual Soldier Hemostatic Dressing

In September 2005, in a policy entitled "Individual Soldier Hemostatic Dressing", the OTSG approved the chitosan hemostatic dressing (Hemcon) to be carried in the following ratios: one per soldier, three per combat Lifesaver, and five per 68W combat medic. Choice of the chitosan dressing, was based on extensive research in animal models, demonstrating the effectiveness of the bandage in stopping hemorrhage, and lack of apparent serious side effects.[22,23] The policy acknowledged that another product, QuikClot, may also be used by properly trained medical care providers and medics, in accordance with the work of Rhee and coworkers[24] and the guidelines in place in the Tactical Combat Casualty Care manual.[25] Although the choice of hemostatic agent stirred considerable debate for several reasons, both products were proven superior to plain gauze bandages, the standard hemorrhage control device carried by every soldier for the last 100 years. Wedmore et al. have shown that the Hemcon product is superior to gauze and functions well in the combat environment,[26] with no known side effects.[27] As of October 1, 2007, the chitosan bandage became part of the Improved First Aid Kit (like the CAT), to be carried by every soldier. Both hemostatic agents are most useful for wounds too proximal for effective tourniquet placement. We think that the chitosan bandage remains an important adjunct to tourniquets and the Emergency Trauma Bandage ("Israeli Bandage") as a means to stop life-threatening hemorrhage. Hemostatic dressings before and immediately after the Vietnam era remained plain gauze bandages.

The Conduct of Human Subjects Research in the Multinational Corps, Iraq, Area of Operations

In March 2005, a historic Memorandum of Understanding (MOU) was signed between The Army Surgeon General and the Commander, Multi-National Corps, Iraq, entitled "The Conduct of Human Subjects Research in Army Medical Treatment Facilities in the Multi-National Corps, Iraq, Area of Operations". This document and a follow-up amendment in November 2005, established a theater-based human re-

search protection program with detailed procedures and specified responsibilities for scientific review and human subject protections for research conducted in Iraq. As described in an article by Brosch et al. in this *J Trauma* supplement, it specified that all protocols involving human subjects must be reviewed by an Institutional Review Board and that investigators must be qualified to conduct research and have proper training in the ethical conduct of human research. This policy, initiated during the tour of the 44th Medical Command (MEDCOM) in Iraq, set the stage for sending a 6-person research team into theater on 6-month rotations. This was an important effort, mirroring exactly the research teams deployed to Vietnam that had yielded numerous published studies about critical aspects of combat casualty care, including transfusion, coagulopathy, organ failure, and sepsis. This agreement was very unique as it was the first ever MOU between The Surgeon General and a Combatant Commander. The MOU acknowledges the importance of research to optimize combat casualty care and ensures safe and compliant conduct of such research in a combat setting. This policy copies exactly the efforts by the then COL Hardaway (now BG ret) and his team from the Vietnam era.[28]

High Incidence of Hand Burns

In December 2005, OTSG HP&S forwarded an ALARACT entitled "High Incidence of Hand Burns". The ALARACT identified a disproportionately high number of OIF/OEF soldiers returning with hand burns compared with burns of other body parts. This critical observation was reported by clinicians at the USAISR, Fort Sam Houston, TX, the medical treatment facility (MTF) to which all serious burn victims from the Department of Defense are evacuated. The majority of burns were related to explosions. However, as described by Hedman et al. in this *J Trauma* supplement, in some cases, the hand burns were the only burns a casualty suffered. This can occur with burning of human waste, for example, in which accelerants are poured into a barrel to ignite human waste for disposal, common early in the war. The ALARACT emphasized wearing fire resistant gloves (e.g., Nomex) during high-risk operations (Fig. 1A and B). We realize that wearing these gloves in an extremely hot environment may be difficult, but the long-term disability associated with hand burns is significant and even short-term protection (a few seconds) from the high heat flash of an explosion may spare a soldier from lifelong disability. No specific hand burn policy is available from Vietnam, although this issue was identified as important during that era as well. Casualties with more significant burns were evacuated to the 106th General Hospital (special burn unit) in Japan. From there, like today, casualties with severe burns requiring ongoing burn treatment were evacuated to the Army Burn Unit in San Antonio (known as the ISR today).

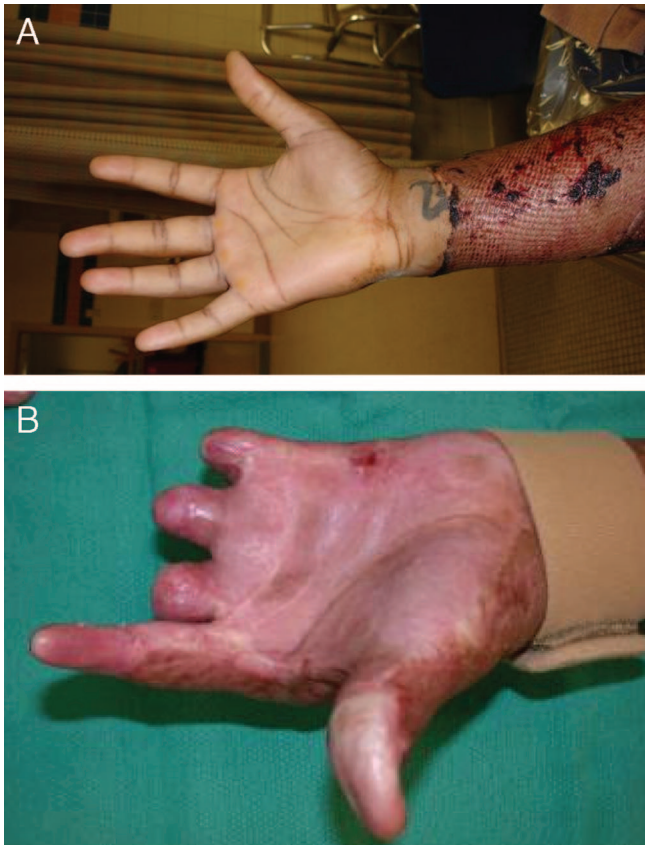

Fig. 1. *A. Soldier wearing fire-resistant gloves. The hand was spared. B. The devastating impact of severe hand burn.*

Release of Actionable Medical Information Policy Memorandum

Also in December 2005, OTSG published a policy entitled "Release of Actionable Medical Information Policy Memorandum". This policy arose during a period of increasing concerns that medical information provided in a variety of forums (professional journals, national meetings, discussed in the media) was aiding the enemy to develop more effective means to wound and kill our soldiers. Of particular concern were publications or presentations that exposed weapons system or equipment vulnerabilities, linked wounding methods and wounding patterns, showed casualty wounding patterns while wearing defined personal protective equipment, and linked injuries to defined vehicles or discussed failure of personal protective equipment or vehicles. In the era of widespread internet availability and rapid dissemination of news and medical presentations and publications, these issues became very real, very quickly. In fact, diagrams on the front page of a leading international newspaper identified where to shoot soldiers, so body armor could be defeated. This policy was the first of its kind to acknowledge these concerns and establish protocols for review of all medical information to be publicly released. The three-step process consists of Operational Security review, public affairs review, and a medical review to analyze the scientific soundness of the information.

The US Army MEDCOM Major Subordinate Commands were directed to develop their own procedures to ensure this three-step process was followed. This policy led to concern among some members of the medical community that important medical or scientific information would be suppressed, in the sense that it would not be made available to stimulate new ideas and products to further improve combat casualty care. These concerns were specifically addressed and many senior medical leaders participated in writing this important policy. However, it made clear we must strike a balance between providing our enemies information they can use against us and sharing information in a way or forum which does not stifle further research and development of products that can be used to save lives of military and civilian casualties.

Defense-wide Policy on Combat Trauma Casualty Hypothermia Prevention and Treatment

In February 2006, the Assistant Secretary of Defense (Health Affairs) published a policy entitled "Defense-wide Policy on Combat Trauma Casualty Hypothermia Prevention and Treatment". This policy was based on concerns that casualties were arriving at in-theater MTFs suffering from hypothermia, despite the high environmental temperatures. Desert climate combat casualties were at risk for developing hypothermia, particularly those with massive hemorrhage. The higher elevations in Afghanistan and winter months in Iraq might also predispose to low body temperatures. The policy directed an inventory of hypothermia preventive and treatment products in combat theater and a summary of training which emphasized hypothermia prevention and treatment for medical personnel. The Navy published a similar policy. This policy drew attention to body temperature as an important risk factor associated with higher risk of death and the need for aggressive efforts to prevent or minimize loss of body heat in critically wounded casualties. Improvised methods (e.g., modified body bags) to maintain body temperature were used in some cases, but the introduction of Hypothermia Prevention and Management Kits was also effective in minimizing the risk of hypothermia.[25] These efforts are applicable at all levels of care, from self and buddy aid, through the combat support hospitals. Data from Level III MTFs now demonstrate decreasing rates of casualties arriving with body temperatures less than 95°F.[29] This should have a favorable impact on survival. Although there was no specific policy in Vietnam addressing hypothermia, surgeons were aware that administration of large amounts of cold intravenous fluids and blood might lead to ventricular fibrillation.

Concussion in Soldiers on the Battlefield

By July 2006, it had become increasingly apparent that traumatic brain injury (TBI), along with posttraumatic stress disorder, were extremely important but less well-understood risks associated with exposure to combat. An ALARACT, entitled "Concussion in Soldiers on the Battlefield", pointed out to theater commanders that concussion (or mild TBI) may reduce a soldier's combat effectiveness and lead to poor marksmanship, delayed reaction times, and decreased ability to concentrate, among other signs and symptoms. The ALARACT defined the signs and symptoms of concussion and "red flags" which may indicate more serious brain injury and warrant immediate referral. The main focus of this policy was soldiers with concussion, or mild head injury, which might occur several times during a 12-month combat tour. There were anecdotal reports of soldiers being "knocked out" several times in 1 day and concern about the potentially deleterious short-term effects (and unknown long-term effects) of such a succession of events. Although most soldiers with combat-related concussion recover over time, in some soldiers symptoms may persist. Recognition of this possibility with symptomatic treatment and education of soldiers and their families is critical for optimal recovery. The Army has subsequently begun predeployment neurocognitive testing to establish a baseline, with repeat testing to follow "blast overpressure exposure" or repeated concussion exposure, as indicated. In the future, baseline testing may be performed upon entering the service, as many such concussive events may occur before entry. Further research must be conducted on the long-term effects of mild head injury, and on distinguishing symptoms of mild TBI from those of posttraumatic stress disorder. Recognition of and treatment for mild TBI or concussion, as opposed to penetrating head injury, is not mentioned in the 1958 North American Treaty Organization (NATO) Handbook or in Vietnam policy bulletins.

Management of Soldiers with Tension Pneumothorax

In August 2006, OTSG HP&S published a policy entitled "Management of Soldiers with Tension Pneumothorax". This policy arose based on concerns that "potentially survivable" deaths were occurring because of tension pneumothorax and that, in some cases, attempts at needle decompression of the tension pneumothorax had failed. One reason for failure was inadequate needle or catheter length; that is, shorter needles (2.5 inch, 14 gauge) available for intravenous line placement were used for decompression, but were not long enough to reach the pleural space in some soldiers. The Armed Forces Medical Examiner conducted computed tomography studies of chest wall thickness in deceased casualties. These data were used to validate and verify the needle length required to consistently reach the pleural space and decompress a life-threatening tension pneumothorax. These data, along with recently published data from the Vietnam War, civilian trauma literature, and tactical combat casualty care (TCCC) were the basis for this policy, emphasizing that longer needles or catheters (3.25 inch, 14 gauge) were required to most reliably perform this procedure. The longer needles are available in 68W Combat Medic Aid Bags and Combat Lifesaver Bags. There is a persistent belief by some that the needles should be carried by all soldiers (not only those with medical training), although the risk-benefit ratio of doing so is unclear at

this time. Some Special Operations units have adopted this policy. Clear guidance on which needle to use should reduce the likelihood of preventable death caused by tension pneumothorax, which in Vietnam was documented at 3% to 4% of all deaths.[30] Needle "aspiration" for tension pneumothorax is mentioned in the 1958 NATO Handbook, although there is no apparent policy describing the importance of needle length to help ensure adequate decompression, especially in the prehospital environment.

Army Medical Department Predeployment Trauma Training

In December 2006, OTSG HP&S published policy which standardized recommended predeployment trauma training for all Army Components (Active, Reserve Component, and National Guard). Both certifications (e.g., Advanced Trauma Life Support, Advanced Cardiac Life Support, Tactical Combat Casualty Care) and several trauma training programs, including the Joint Trauma Combat Management Course provided by the Army Medical Department Center and School were strongly recommended before deployment. This policy recommended, by Area of Concentration or Military Occupational Specialty, which certifications and courses should be taken. The policy stopped short of making this training mandatory, a subject of much debate. A unit commander must make the assessment of how well his or her medical personnel are prepared for combat, based on their current level of experience and training, balanced with the planned mission requirements. Although it is difficult to measure the impact of such trauma training, course evaluations have been extremely favorable as preparation for deployment. Surgeons who deployed to Vietnam oftentimes did not undergo such predeployment training, arriving from their civilian practice with their previous trauma experience; however, efforts were made to pair newly arrived surgeons with experienced teams to shorten the learning curve associated with combat surgery. Every effort must be made to eliminate this "learning curve" today, as we are doing with relevant, intensive predeployment trauma training, largely focused on the lessons and data captured in these policies and guidelines.

Optimal Resuscitation of Severely Injured Soldiers

In January 2007, data aggregated by the USAISR showed a clear survival benefit to casualties requiring massive transfusion (>10 units packed red blood cells[PRBCs]) if fresh frozen plasma (FFP) was administered along with PRBCs in a ratio as close to 1:1 as possible.[31] This 46% absolute reduction in mortality was significant and part of a larger strategy known as damage control resuscitation.[32,33] To this end, emergency departments at combat support hospitals in theater began to store thawed FFP to facilitate early administration to casualties likely to require massive transfusion.[34] This concept represents a true change to clinical resuscitation practice and is being rapidly adopted into current civilian trauma practice. It is our impression that this change in resuscitation practice may represent the single most important advance in trauma care for hospitalized civilian and military casualties from this war.

Management of OIF/OEF Casualties Requiring Extremity Fasciotomy

In May 2007, OTSG HP&S published policy based on data that raised concerns about casualties arriving in Germany with either missed compartment syndrome or incomplete fasciotomy, if fasciotomy was performed in theater. The policy was based on data from Ritenhour et al., whose article appears in this *J Trauma* supplement, showing more muscle necrosis, higher mortality and higher amputation rates in casualties in the group with incomplete fasciotomies or missed compartments. The most commonly missed compartment was the anterior compartment of the lower leg. The policy recommended liberal use of complete fasciotomy, prophylactic use in high-risk extremities and delay in evacuation (which is usually very rapid at <24 hours) for US and coalition casualties if clinical concern warranted further observation. The data, based on a series of 337 combat casualties over 18 months represent the largest collection of extremity injuries with fasciotomies ever recorded. The 1958 NATO Handbook recommends liberal use of fasciotomy as well, as an additional precaution for prevention/treatment of compartment syndrome, although other Vietnam guidance warns against "routine" use of fasciotomy. It is clear that the need for fasciotomy was recognized by Vietnam surgeons, although they lacked access to follow-up data with which to provide feedback to theater surgeons regarding timely performance of complete fasciotomy, as we were able to do with the deployed research team[35] and the Joint Theater Trauma Registry, described in this *J Trauma* supplement by Brosch et al.

Documenting Blast Exposure/Injury in Theater Medical Records

The final, and most recent, policy was entitled as above. This policy follows up on the July 2006 concussion policy, emphasizing the importance of documentation of exposure to explosions in the theater electronic medical records at Levels 1 and 2 (medical care far forward in combat). As described by Ritenour et al. in this *J Trauma* supplement, explosions are very common and open space explosions represent the vast majority of injuries in theater. The policy delineates specific ICD-9 codes for use and notes that this documentation will become part of a soldier's permanent electronic medical record (visible to providers back at home station and to providers of the Veterans Healthcare Administration). Ongoing discussions include the need to standardize definitions of "exposure" and efforts are currently underway to place accelerometers in combat helmets to provide actual measurements of blast overpressure exposure versus traditional concussions. The true effects of explosion and whether "blast overpressure" is a significant cause of injury in combat today are unclear, although Ritenour's data from >400 casualties documented that blast overpressure injuries are uncommon in

the most seriously injured casualties. True "blast overpressure" injuries are infrequent and the consequences of repetitive concussions, or mild TBI, in soldiers are unknown. A recent study of retired National Football League players showed a higher risk of major depression in players who had sustained three or more concussions during their playing career.[36] Accurate documentation of "exposure", although an imprecise term, will allow better follow-up and treatment of symptoms, as well as education of soldiers and families about mild TBI. The 1958 NATO Handbook notes that documentation on a casualty's emergency medical tag is imperative to facilitate continuity of care; however, medical documentation in Vietnam posed its own set of challenges.

DISCUSSION

This article discusses the genesis of OIF/OEF combat casualty care policies and, where appropriate, compares these with policies and guidance in place during the Vietnam War. Current wartime care policy and civilian trauma care has benefited enormously from the experience and data analysis of the Vietnam War. Although data capture is vastly improved compared with Vietnam, we are still far from satisfied with the turn around time on data entry, analysis, resulting written policy, and change in practice. Nevertheless, current combat casualty care policy was informed by significant combat medical data analysis in 6 of 13 policies today. Many of the articles published in this supplement represent such analysis. The effort to publish in the open medical literature represents a conscious decision by the military leadership, allowing widespread documentation of common problems and solutions, and laying down a written history for the next generation of combat physicians.

Vietnam War policy directed use of the NATO Handbook, Emergency War Surgery manual as the sole guide to therapy. One policy states that medical officers will only deviate from NATO procedures with permission and, if they do so, must be prepared to provide justification to their Commanding Officer. Although in OIF/OEF we have not directed use of the Emergency War Surgery manual, the manual was updated in 2003 and made available to medical personnel via the internet and computer discs were delivered to theater. In Vietnam, abdominal closure with wire was mandatory to minimize the risk of wound infection. Mandatory placement of prophylactic retention sutures or wire was also practiced to prevent evisceration if abdominal wound dehiscence was to occur. Conversely, there are no such mandatory policies in the current conflict and other than the hypothermia policy (written by Office of the Assistant Secretary of Defense/Health Affairs), OIF/OEF policies were written as ALARACTs, which pertain to Army-only facilities in theater, although all have been shared with the Navy, Marines, and USAF. Most of the Army policies resulted in Central Command clinical practice guidelines and are on the Joint Patient Tracking Application website. Given the multi-service nature of the current combat theater, the ideal policy would be written and published in a joint fashion.

CONCLUSION

This article documents the development of combat casualty care theater policies during the Global War on Terrorism in the OIF/OEF theaters of operation. It is difficult to measure the impact of combat medical policy, given the changing nature of wounds and wounding agents, fluid nature of modern combat, and the inherent difficulties of data acquisition and analysis across three continents. Like those of our predecessors in Vietnam, the efforts to document, analyze, and turn the hard won lessons of modern combat casualty care into published policy have involved many individuals. Publishing the lessons learned will document the current "state of the art" and motivate us to improve care on this and future battlefields.

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DISCUSSION

Dr. George W. Weightman (US Army Medical Research and Materiel Command, Fort Detrick, MD): This article by Cordts et al. reviews 13 policies from OIF/OEF and compares them with policy, where available, from the Vietnam War. Dr. Cordts did an excellent job in pointing out the major advances that have been made in technology during the present conflict: hemostatic dressings, low molecular weight heparin, IVC filters, etc. He makes a very compelling case that much of the improvement in outcomes can be traced to changes in policy driven by new technology, recognition of the need for medical training at all levels, and establishment of clinical practice guidelines in a combat theater of operation. Indeed, one of the salient points to be taken away from this article is the value of doing real time research during combat operations and then converting those results into actionable data. What I didn't see addressed in the article but feel would be very enlightening, is the topic of the speed of change of policies and training now versus how long it took to change during Vietnam. Are we truly harnessing the efficiency of the Information Age or are we on the same time schedule we were 40 years ago?

The importance of setting up a Joint Theater Trauma System and associated Registry cannot be overstated. This system enabled our providers and policymakers to have the hard data to do valid and timely outcomes-based research. I do not believe that this has occurred to this extent in any previous conflict of this duration. Because of the volume of trauma patients encountered in this conflict, as opposed to that which is encountered in most civilian trauma centers, there is a magnificent opportunity to do statistically meaningful trauma research in a relatively short amount of time and impact how all trauma patients, not just military casualties, are treated.

An area that was touched upon briefly by Dr. Cordts but I believe merits further study is the potential ethical dilemma faced by researchers in determining how much information to make public on injury patterns. Certainly researchers want to make our developers and trainers knowledgeable of the strengths and vulnerabilities of our equipment and training; however, what gets placed in open sources and subsequently made available to the enemy? There has to be a balance between scientific inquiry and tactical relevance to ensure the troops get the maximum protection and trauma care in a timely manner.

I would also like to highlight the importance of the holistic approach to training that has been undertaken by the Services' medical departments and their policymakers. Training for the individual Soldier, the combat lifesaver, the medic, the surgical teams in forward-deployed hospitals to the medical centers has all been enhanced to optimize not only survival but also functional outcomes. This truly recognizes the importance of proficiency at all levels of the continuum of care which must be unbroken for our Servicemembers to thrive.

In summary, I congratulate the authors on this important article. Reflecting on past practice is essential to learn and remind ourselves of the precepts practiced by medical personnel during past conflicts. These policies save lives; but the evolution of war, like medicine with its advanced technologies, will likely mandate new policy when that time comes.