



# Winds of War: Enhancing Civilian and Military Partnerships to Assure Readiness: White Paper

C William Schwab, MD, FACS

This White Paper summarizes the state of readiness of combat surgeons and provides action recommendations that address the problems of how to train, sustain, and retain them for future armed conflicts. As the basis for the 2014 Scudder Oration, I explored how to secure an improved partnership between military and civilian surgery, which would optimize learning platforms and embed military trauma personnel at America's academic medical universities for trauma combat casualty care (TCCC). To craft and validate these recommendations, I conducted an integrative and iterative process of literature reviews, interviews of military and civilian leaders, and a survey of military-affiliated surgeons. The recommended action points advance the training of combat surgeons and their trauma teams by creating an expanded network of TCCC training sites and sourcing the cadre of combat-seasoned surgeons currently populating our civilian and military teaching hospitals and universities. The recommendation for the establishment of a TCCC readiness center or command within the Medical Health System of the Department of Defense includes a military and civilian advisory board, with the reformation of a think tank of content experts to address high-level solutions for military medicine, readiness, and TCCC. (J Am Coll Surg 2015;221:235–254. © 2015 by the American College of Surgeons)

*The task is not so much to see what no one yet has seen, but to think what no one yet has thought about that everyone sees.*

—Arthur Schopenhauer 1788-1860

## INTRODUCTION

Military and civilian partnerships have informed surgical discourse and saved lives throughout history.<sup>1,2</sup> In the 20th century, these partnerships produced Red Cross and Reserve military hospitals embedded within medical universities, which mobilized in times of war.<sup>3-5</sup> This continuity of access to the best thinkers in civilian surgery, as senior surgical consults for the military, benefited the nation. Such partnerships assured that in times of need, the country's defenses could rely on the civilian surgical sector for expert advice, resources, and capacity.<sup>6-8</sup>

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From the Division of Traumatology, Surgical Critical Care and Emergency Surgery, Penn Presbyterian Medical Center, Philadelphia, PA.

Correspondence address: C William Schwab, MD, FACS, Division of Traumatology, Surgical Critical Care and Emergency Surgery, Penn Presbyterian Medical Center, 51 North 39<sup>th</sup> St, 120 MOB, Philadelphia, PA 19104. email: [schwabc@uphs.upenn.edu](mailto:schwabc@uphs.upenn.edu)

The last 2 decades of conflict have seen dramatic advances in military medicine that have improved trauma care for combat, mass casualty, and civilian injuries.<sup>9-15</sup>

However, as the hope for peace suffuses our hearts, the media's interest in war fades, and the public turns back to daily life, the need for readiness fades from our priorities. This loss of focus is not new. Surgeons and soldiers back to antiquity have commented on the abrupt postwar shifts away from the lessons of the battlefield.<sup>2,8</sup> From a medical perspective, this translates into reduced readiness and potential loss of life when the winds of war return. History also records that as military action inevitably roars back, there is little time to reconstruct and assure optimal response from this diminished state of readiness. Surgeons responding yet again to war find themselves ill prepared for the demands of the battlefield and lacking the competencies for the surgery of combat.<sup>16,17</sup>

## BACKGROUND

The 1991 Kuwait and Iraq war introduced a new type of conflict on the world stage, making conventional military medical platforms and units obsolete.<sup>18,19</sup> Catalysts for changing military medicine included Trunkey's 1993 paper, "Lessons Learned," which precipitated the US Government Accountability Office and the Department of Defense (DOD) supporting research on the battlefield and in-theater data collection and registry.<sup>20,21</sup> Lt Gen Carlton, then Surgeon General of the Air Force, recognized the need to rapidly transport the critically wounded

**Abbreviation and Acronyms**

AMC	= academic medical center
DHA	= Defense Health Agency
DOD	= Department of Defense
EAST	= Eastern Association for the Surgery of Trauma
JTS	= Joint Trauma System
MHS	= Military Health Service
NTDB	= National Trauma Data Base
TCCC	= trauma combat casualty care

out of theater and to levels of higher care in safe environments.<sup>22</sup> The impact of the Critical Care Air Transport Teams and the technological advance of their flying ICU platforms changed how we think about trauma systems and created the global trauma system.<sup>23-25</sup> As early as 1994, the military and civilian sectors found benefit in stationing key military medical personnel at busy Level I trauma centers for skills enhancement and, subsequently, several military civilian trauma training centers were developed for the Army, Navy, and Air Force.<sup>21,26,27</sup>

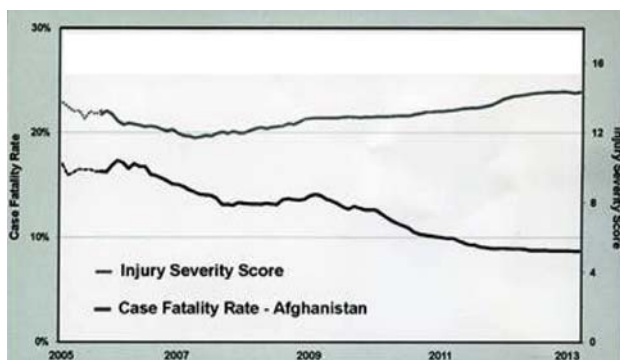
Medical and surgical history has been made with the delivery of astonishing clinical care delivered under conditions and in environments that few of us can imagine (Fig. 1). This prolonged armed conflict has recorded data from wounding on the battlefield through recovery and rehabilitation.<sup>9,15,28,29</sup> The establishment of the Joint Trauma System (JTS) and Joint Theater Trauma System supported by a robust DOD Trauma Registry (formerly the Joint Theater Trauma Registry) have built a responsive, data-driven global trauma system directing care in country and throughout the world.<sup>9,30-34</sup> The ongoing conflicts in Iraq and Afghanistan involved a Joint Coalition force of multiple armies, navies, and air forces. Perhaps for the first time, medical units from the Army,

Navy, and Air Force were integrated, working well together in the same tent, inside and outside the wire, and across two battle theaters on different continents.

Many civilian surgeons participated and all witnessed the benefit of putting senior civilian surgeons back into play as consultants in combat support hospitals and eventually on the ground in Iraq and Afghanistan. The Senior Visiting Surgeons initiative of the American Association for the Surgery of Trauma and American College of Surgeons has been a substantial success.<sup>6,35,36</sup> Within a few months of the initial 2006 deployment in Germany, the endeavor spread to include orthopaedic and vascular surgeons. Perhaps the greatest measure of the success of this Senior Visiting Surgeons partnership was the verification of the first American College of Surgeons military trauma center at Landstuhl Regional Medical Center.<sup>37,38</sup> Because of the trust created by these newfound partnerships, civilian trauma surgery leaders acted as high-level civilian consultants on the battlefields. An interdisciplinary team saw war up close and rendered sage advice for bringing the JTS to maturity. This review provides specifics on how to use data, evidence, and a systems approach to advance battlefield care and recommends a surgeon-led readiness command for combat casualty care.<sup>39</sup>

The *Journal of Trauma* and *Military Medicine* became strong vehicles for the hundreds of papers on the advances from the battlefield, the science of resuscitation, and translations from the military trauma systems, and the DOD Trauma Registry.<sup>34,40</sup> The transfer to civilian practice and the responses of our civilian centers to support the military medical corps was beyond anything that had been seen since the two great wars of the early 20<sup>th</sup> century. Dr Pruitt, more than any other individual, assured that the chronology and advances of this war were documented and are now an indelible part of medical history.<sup>16,41,42</sup>

In the Penn program, my colleagues and I experienced early stationing of military surgeons for fellowship training in trauma surgery and critical care. Young faculty were deployed as surgeons to Iraq and were in constant dialogue with our faculty and staff. These dialogues revealed a mismatch between the clinical training of fellowship and the surgical techniques necessary to control massive wounding and mass casualty incidents.<sup>43</sup> In addition, they needed more team training and familiarity with advanced practice providers and nonsurgeons performing surgical procedures, cavity packing, use of topical hemostatics, and triage. They reported performing humanitarian surgery for the children, mothers, and elderly civilians caught on and living in the battlefield. And they sought emotional outlets for the horrors of the battlefield and the continual maiming and loss of life of valiant young soldiers.



**Figure 1.** Impact of military trauma care and research. Reduction in mortality on the battlefield of Afghanistan is unprecedented compared with earlier military conflicts. (Reprinted from Rasmussen and colleagues<sup>15</sup> with permission from Wolters Kluwer Health, Inc.)

As I spoke with the chiefs of service at other trauma centers and interviewed returning surgeons, it became apparent that we were not preparing surgeons for deployments and the avenues for near-deployment training were not being well used.

Several progressively complex questions emerged during this time.

1. What is the necessary surgical skills tool box for deployment?
2. As new skills were developed, how were they brought to the operating table for practical training?
3. What were the national military civilian trauma training centers teaching and how did their faculty prepare trainees, customize curricula, and measure outcomes?
4. How can we create a robust learning platform and provide the necessary surgical competencies from all surgical disciplines for combat surgeons?
5. As the war unfolded, why were the seasoned combat-experienced surgeons leaving the military, just as they were most needed to guide and protect our young surgeons who had never seen war?
6. Who “owns” the medical readiness mission of the Army, Navy, and Air Force in the DOD?

To answer these questions and make recommendations on how to train combat surgeons and improve readiness, it became clear that I needed to embark on a foundational study of the DOD, its Military Health Service (MHS), and the surgical workforce necessary to go to war.

## METHODS

To address the needs for training and the development of the necessary skills for a combat-ready surgeon, I sought to compile and synthesize published descriptive and outcomes studies based on battlefield trauma databases and survey a large group of military surgeons who deployed during these last 2 decades.

To address preventable deaths on the battlefield by continuing to improve military medicine between wars as well as during conflict, I sought to summarize the last 12 months of my study of the medical readiness side of the MHS; conduct and compile information from interviews of military and civilian surgical leaders, past, present, and future; and describe the capacity for developing new knowledge for the field of military medicine.

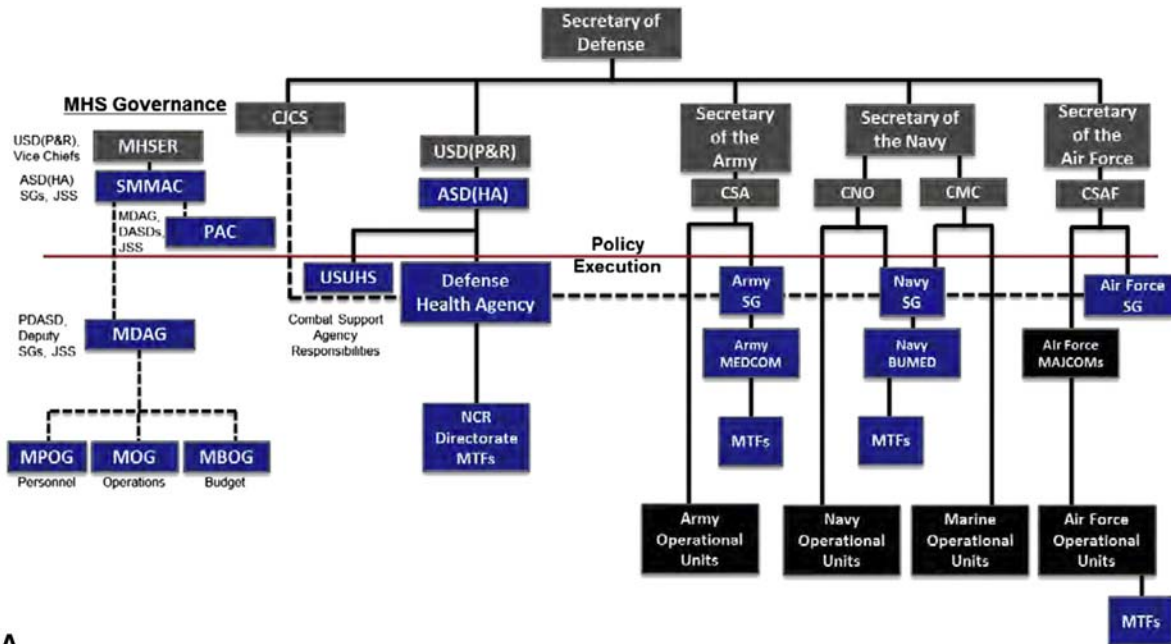
To identify the organizational needs for a better surgical workforce, necessary training, and potential for retention, I sought to explore and highlight the resources and needs of the MHS and civilian health system through

these surveys and interviews; perform an analysis of US civilian trauma centers based on characteristics favorable for training trauma combat casualty care (TCCC) surgeons and teams; conduct a sample study of the geographic distribution of military-affiliated surgeons and examined the demographics, practice type, experience, and case load of these surgeons, including active duty, reserve, recently separated, and retired personnel; and elicit expert opinion to corroborate the results of earlier surveys and reports and perform side-by-side comparison and validation.

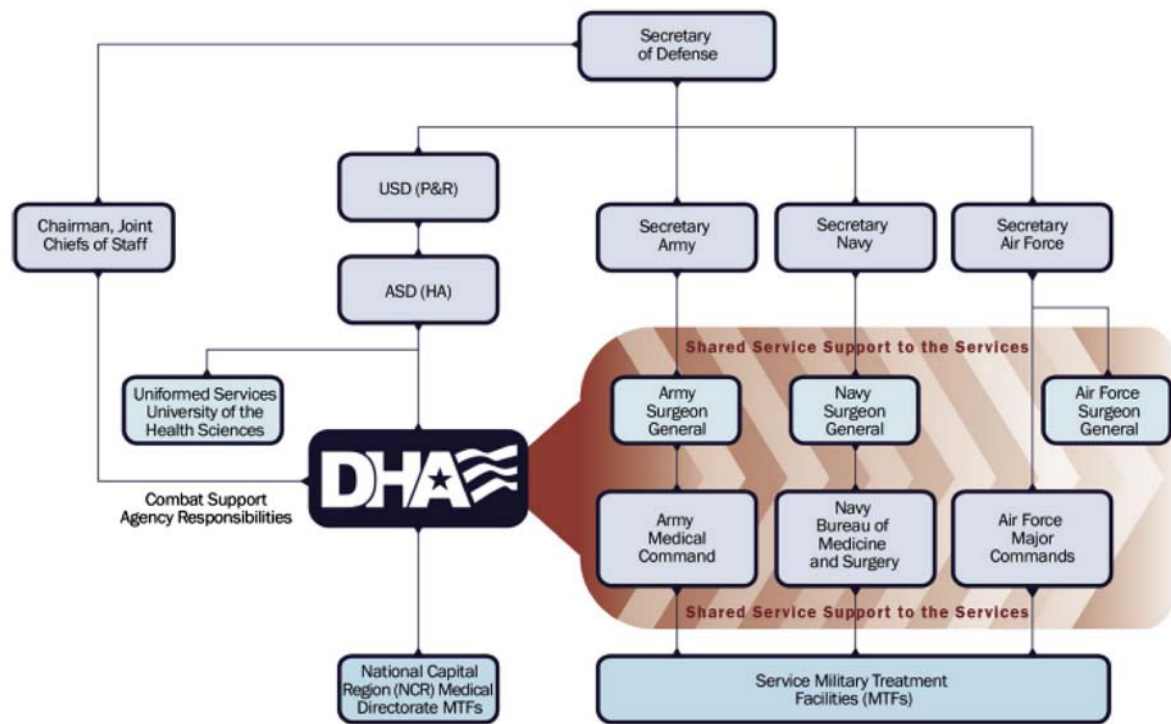
In addition, I used my personal foundational experiences with the military, both in and out of uniform, and involvement with military and civilian trauma systems to formulate specific action recommendations.

## Interviews

A series of interviews with military and civilian surgeons, physicians, and administrators was carried out between November 2013 and October 2014. These included military-affiliated surgeons recently deployed and serving as general surgeons, trauma and surgical critical care surgeons, senior administrators, trauma program directors, military trauma training faculty, deployed “trauma czars,” and commanding medical officers when deployed. In addition, several DOD general officers and personnel in the Defense Health Agency and MHS were visited and interviewed in more lengthy sessions. The president and dean of the Uniformed Services University of the Health Sciences participated in the interview process and provided guidance and advice throughout the study period. Respondents were from active duty and reserve duty backgrounds and in military pay grades that spanned from O-3 to O-9. The Assistant Secretary of Defense for Health Affairs was also interviewed. There was an effort to concentrate on a group of active duty O-6 level medical officers (Colonels and Captains) and reserve high-level administrators (O-6 and O-8) who dealt with assignments of reserve and National Guard surgeons and medical units. The surgical chiefs of the national military trauma training programs were also interviewed or visited. Lastly, several civilian senior health system or hospital directors not affiliated with the military were interviewed. The interview content varied according to the experience and position of the respondent. For those in positions to create policy, the interview focused on how to reframe and improve training, education, and retention of the trauma surgeon for and in the military. For individuals still in a position for future deployment, the focus was on what they believed would better prepare them for combat and what might keep them in the military as a career surgeon.



A



B

The DHA reports to the Assistant Secretary of Defense for Health Affairs (ASD [HA]) and provides support to the three Military Services.

**Figure 2.** (A) An overview of the Military Health System. (B) The Defense Health Agency. The DHA reports to the Assistant Secretary of Defense for Health Affairs (ASD [HA]) and provides support to the three Military Services. BUMED, US Navy Bureau of Medicine and Surgery; CJCS, Chairman of the Joint Chiefs of Staff; CMC, Commandant of the Marine Corps; CNO, Chief of Naval Operations; CSA, Chief of Staff, Army; CSAF, Chief of Staff, Air Force; MAJCOM, Major Command, Air Force; MDAG, Medical Deputies Action Group; MEDCOM, US Army Medical Command; MHSER, Military Health System Executive Review; MOG, Medical Operations Group; MBOG, Medical Business Operations Group; MPOG, Manpower and Personnel Operations Group; MTF, military treatment facility; NCR, National Capital Region; PAC, Policy Advisory Council; SG, Surgeon General; SMMAC, Senior Military Medical Action Council; USD(P&R), Under Secretary of Defense for Personnel and Readiness; USUHS, Uniformed Services University of the Health Sciences.



## Survey

We partnered with the Military Ad Hoc Committee of the Eastern Association for the Surgery of Trauma (EAST) to develop and complete a survey of all its military-affiliated members. The content of the questionnaire was formulated by a group of 6 surgeons, 5 had recently deployed as combat surgeons and completed or were completing fellowship training. One surgical fellow had no military experience. Of note, 4 of the military surgeons had deployed as general surgeons to far forward assignments and then returned to civilian fellowship training. After completion of fellowship, they experienced additional overseas deployments in more senior positions (eg, trauma program director or trauma czar). This group included the subject content experts for interpretation, analysis, and preparation of the data.

The survey gathered information about surgical training, current and deployed surgical practice experience, and procedures commonly performed when deployed and in peacetime practice. Geographic distribution, predeployment training and preparation, and data on the most challenging cases during deployment, were compiled. Lastly, my colleagues and I assembled information on the optimal combat surgery skill set; where and how to obtain that skill set during peacetime; and what elements in a civilian trauma center experience are the most important to train, sustain, and retain a military surgeon's interested in trauma surgery as a career in the military.

The 28-question survey, which used 5-point Likert scales, was approved by the IRB of the University of Pennsylvania and distributed electronically to 174 EAST military-affiliated members; 100 surveys were returned and 86 surveys contained complete data for analysis. Surveyors were blinded to the distribution list.

## Analysis of civilian trauma centers

To identify the nation's busiest trauma centers and those that had higher volumes of penetrating injury, we partnered with the American College of Surgeons and sought demographic data from the National Trauma Data Base (NTDB). The 2012 trauma admission data were used.<sup>44</sup> Centers were identified by state and city name only and no individual hospital or personnel descriptors were supplied. We searched for trauma centers by geographic location (metropolitan service areas) and by escalating volumes of trauma patient admissions and gunshot wound injury admissions. We reviewed and mapped centers by intervals of 500 patient admissions from 2,500 to >5,000 admissions per year with substantial percentages of gunshot wound injury admissions. To better understand the availability of burn and

pediatric training, we cross referenced the NTDB's high-volume trauma center data with locator data from the American Burn Association and American Pediatric Hospital. To identify centers that did not participate in the NTDB, we used publications, presentations, and personal knowledge to assemble a possible list of cities and states that have the potential to house a military and civilian trauma training center.

## FINDINGS

### Organizational needs for training and retention

The MHS of the DOD has two clinical missions: readiness and beneficiary care. The Assistant Secretary of Defense for Health Affairs is responsible for all policy, programs, and activities of the MHS. Within the MHS, the health missions are delivered along the organizational lines of the Army, Navy, and Air Force and are administered through the Office of the Surgeon General of each corps. Recently, the Office of the Defense Health Agency was established under the Assistant Secretary of Defense for Health Affairs. This office, headed by a Lieutenant General, is charged with developing strategies for health care delivery, cost containment, and other opportunities for joint operations of the two medical corps and the offices of the Surgeon General<sup>45,46</sup> (Fig. 2A, and B).

Surgeons and the TCCC teams must be the "medical ready force" for the DOD and United States. Readiness is critical to national defense and cannot be duplicated by any other agency or group of medical or surgical providers. Trauma combat casualty care is the core value of military medicine and for the medical corps of the triservices. However, very few senior surgeons are focused on assuring readiness. Currently, there is not a single agency or command that has the readiness responsibility; no one seems to "own" it!<sup>45,46</sup>

The surgical workforce and trauma teams come from very diverse backgrounds and experiences, including active duty, reserve, and National Guard. No universal definition or competencies or skill set is required to be deployed as a combat surgeon. At the start of the Iraq war, there was no military trauma system, trauma registry, or consolidated effort to coordinate Army, Navy, or Air Force medical resources. However, starting in 1996, the Army, Navy, and Air Force, in response to the US Government Accountability Office's report, and with support of the then serving Surgeon Generals, developed trauma training programs, which subsequently led to several national predeployment training programs for each branch. These centers will be discussed.<sup>21</sup>

Within the last few years, the JTS was established in San Antonio and has begun to create policy-guiding trauma system, center, and surgeon development. The leadership of the JTS has been impactful. The JTS has collaborated well with the American College of Surgeons and Committee on Trauma leadership, American Association for the Surgery of Trauma, and other trauma-focused associations to promote civilian dialogue, knowledge, and involvement.<sup>31,39,47</sup> The close working relationships between the JTS, Joint Theater Trauma System, Department of Defense Trauma Registry, and civilian trauma experts has provided guidance to policy makers in the MHS.<sup>30</sup> Recommendations are pending in the office of the Assistant Secretary of Defense for Health Affairs for elevating the JTS to a center of excellence and having it report to the Director of the Joint Defense Health Agency (DHA).

Beneficiary care provides health care to 9.6 million people worldwide and, due to its size, drives the MHS of the DOD. Currently, it consumes approximately 10% of the annual budget of the DOD, approaching \$50 billion. Its size and expense make it a constant appropriations target. Providing all specialties of care for its beneficiaries, it is built on a model of disease and health management. The beneficiaries are active duty military, dependents, retired, employees, plus others. It is a worldwide system and its direct care components operate 56 hospitals, 361 outpatient medical clinics, and 249 dental clinics, with >86,000 military and 60,000 employees. Delivery of care is organized under the 3 branches of the military, Army, Navy, and Air Force, and is administered by the offices of their respective Surgeon Generals. In addition, the MHS is responsible for education and health research to support and accomplish its missions. The Uniformed Services University of the Health Sciences, located in Bethesda, Maryland, is the epicenter for postgraduate training, education, and research in the MHS, and has a distinguished record in scholarship and generation of leaders in the health sciences for the military and United States.<sup>48</sup>

The most frequent diagnoses of disease managed at military health facilities are conditions of aging (eg, coronary artery disease, chest pain, and cataract) and those related to obstetrical care. Surgeons at large military hospitals deliver elective surgical and surgical subspecialty care and few have any regular experience with complex acute trauma cases.<sup>49</sup>

The contradiction is that only the MHS can deliver TCCC, but this appears dwarfed by the demands of the massive beneficiary care mission.

### **Civilian health systems: emergency care crisis**

The civilian health system is a massive collective of government, nonprofit, not for profit, and for profit health systems, hospitals, medical schools, and health professions schools. Within the civilian health system, emergency and trauma care are a large part of the mission and are demanded by the American public. Civilian emergency care is very large, with 113 to 115 million people a year seeking care at emergency departments and trauma centers. Poorly funded, emergency care accounts for substantial and increasing numbers of patients admitted to hospitals. At academic medical centers (AMCs), teaching hospitals, and medical schools, emergency care services and patients provide a rich and diverse training platform for students, trainees, and residents of all disciplines and specialties.

In 2006, the Institute of Medicine recognized the accomplishments of the American College of Surgeons in the development of the American trauma system and trauma centers as the best example of a public health advance in the latter part of the 20th century. The report, *Future in Emergency Care* used the design and components of the inclusive trauma system as a basis to develop future emergency care systems.<sup>50</sup> Especially noteworthy were the comprehensive approach from incident to rehabilitation, results from continuous performance improvement, ability to lower the mortality of severe injury, cost effectiveness, providing effective training sites, and, lastly, the ability of the trauma system to innovate with the development of a surgical specialty with broad-based competencies for trauma and emergency surgical care.<sup>50</sup>

The Institute of Medicine report also highlighted and singled out the strain being borne by our busiest urban AMCs and these safety net hospitals.<sup>51</sup> They found many of these facilities to be struggling and in need of additional resources to support the critical role they play in assuring readiness for the provision of emergent, urgent, and chronic care and disease management, as well as response to mass casualty and disaster. A considerable part of the emergency care crisis comes from the burden of violence and firearm injury, and there is evidence of "clustering" of firearm injury at urban trauma centers<sup>52</sup> (Auerbach S, "Clustering of urban GSW injury at an urban Level I trauma center," Hospital of the University of Pennsylvania, internal personal communication, August 2013). These events seem to mimic the mass casualty incidents of the battlefield. In many urban safety net hospitals, admissions from interpersonal violence and gunshot wounds account for 20% to 25% of cases, commanding massive resources and jeopardizing the hospital's financial viability.

### The combat-ready surgeon

“He who desires to go to war, must first learn war Surgery.”<sup>14</sup> Times have changed since the 16<sup>th</sup> century and Ambrose Paré, so should how and when we prepare the modern combat surgeon for the battlefield. In this section, I discuss the surgeons who went to war, how they prepared, and what they did when deployed. I also will review the information we gathered from the EAST survey.

Throughout the history of conventional war, the foremost critical role of the forward surgeon and surgical team has been to stop bleeding and relieve suffering.<sup>1</sup> Modern systems (Joint Theater Trauma System, DOD Trauma Registry) for battlefield surveillance have allowed a more granular study of preventable death and disability and improved outcomes. A number of well-done retrospective studies (American, British, and Canadian) confirm that hemorrhage and exsanguination are the leading causes of preventable death on the battlefield. Torso noncompressible and junctional hemorrhage are the most challenging for all involved in combat casualty care and require rapid control of body cavity, extremity, and arterial venous visceral hemorrhage. Open techniques and simple surgical maneuvers to rapidly redirect the limited blood flow to brain, heart, and lungs afford the only chance for life. It is also known that all surgeons deployed at roles 2 and 3 performed hemorrhage control operations in all body cavities.<sup>33,43,53-57</sup> The surgeon has no substitute for this far forward and critical mission.<sup>53,58</sup>

During the last 13 years, surgeons of the Army, Navy, and Air Force came from diverse backgrounds, specialties, and experiences. Active duty, reserve, and National Guard general surgeons and other key specialists were deployed and provided care at all echelons, role 2 through role 5. The key surgical specialties for role 2 and role 3 deployments (forward facilities) were general surgery and orthopaedics, as well as anesthesia providers.<sup>49,59</sup> Of note, general surgeons who deployed came from practices in colorectal, minimally invasive, pediatric surgery, thoracic, vascular, and other specialty domains within the classification of general surgery. As diverse as their major surgical focus, they lived in rural, suburban, and urban America, where they held positions as staff surgeons, chiefs of surgery, administrators, and educators. The vast majority had little experience with the daily delivery of high-stakes trauma surgery. As worrisome, in a 2008 survey of trauma centers in the United States, only 18% of centers (Level I) reported their trauma surgeons could perform a full complement of vascular, thoracic, and abdominal procedures.<sup>60</sup> As the war progressed, more general surgeons

**Table 1.** Surgeon Respondent Demographics (as of February 2011)

Respondent characteristics	Respondents
Branch of service, n (%)	
Army	61 (44.5)
Air Force	43 (31.4)
Navy	33 (24.1)
No. deployments, n (%)	
1	44 (32.1)
2	46 (33.6)
3	30 (21.9)
4	8 (5.8)
5+	9 (6.6)
Duty status, n (%)	
Active	132 (96.4)
Guard or Reserve	5 (3.6)
Years of service at first deployment	
Range	0–28
Median	7
IQR	5–12
Years board-certified at first deployment	
Range	0–26
Median	2
IQR	0.5–5
Fellowship training status, n (%) <sup>*</sup>	
Yes	48 (35.0)
No	89 (65.0)
Theater of operations, n <sup>†</sup>	
Iraq	136
Afghanistan	154
Level of care, role <sup>†</sup>	
2	162
3	133

<sup>\*</sup>Specialty breakdown provided in Tyler and colleagues.<sup>57</sup>

<sup>†</sup>Represents multiple deployments for some individuals.

IQR, interquartile range.

(Reprinted from Tyler and colleagues<sup>57</sup> with permission from Wolters Kluwer Health Inc.)

completed trauma and surgical critical care fellowships and deployed to these forward areas.<sup>61</sup> In both the popular media and medical literature, the delivery of TCCC and trauma surgery on the battlefields of Iraq and Afghanistan and the systems of delivery and care were better than anything the world has ever witnessed.<sup>15,62</sup> These surgeons, anesthesiologists, physicians, nurses, medics, pilots, drivers, and stretcher bearers deserve only the highest praise for how they adapted and supplied care under fire and in conditions few of us can imagine.<sup>63</sup> Their accomplishments are astounding and their service to those in harm's way is heroic.

**Table 2.** Predeployment Surgical Training Course Attendance (as of February 2011)

Surgical training course name	Respondents	
	n	%
Emergency war surgery course	34	24.8
Center for Sustainment of Trauma and Readiness (C-STARS)	13	9.5
Army trauma training center	10	7.3
Naval trauma training center	9	6.6
Combat extremity surgery course	7	5.1
Brooke Army Medical Center	6	4.4
None	58	42.3

(Reprinted from Tyler and colleagues<sup>57</sup> with permission from Wolters Kluwer Health Inc.)

It is still necessary to focus on those areas that require recommendations to assure improved performance. My analysis and recommendations are presented with the utmost appreciation and respect for the men and women of the Armed Forces and, in particular, the medical services of the DOD.

Most of the front-line surgeons were young (mean age of 36 years) at the time of first deployment, and averaged 2 years of board certification. Most had little to no combat experience and many had not seen civilian combat surgery or had a concentrated experience in a high-volume civilian trauma center.<sup>27,57</sup> Most of the general surgeons were not fellowship trained in the earlier war years (Table 1).

In a review of how they were prepared for deployment, there did not appear to be a consistent policy or pathway for “just in time” training or refresher courses (Table 2). Each branch of service appeared to approach the predeployment preparations differently. Attendance and completion of available trauma courses appeared to be variable.<sup>27,61</sup> Approximately 40% did not complete a military predeployment surgical training course, and the percentage attending the extended course offered in civilian and military trauma training centers appears very low compared with the number of surgeons completing surveys and in proportion to the numbers of surgeons deployed by the Army and Navy. There appeared to be no ability to customize the training to match the surgical skills believed to be necessary on the battlefield and the needs of the individual surgeon preparing for war. Combined full trauma team and military surgeon “on call” clinical time was sparse, as it appears the logistics for this were difficult within the civilian trauma center (Table 2).

One survey, largely of nonfellowship-trained general surgeons, asked what additional surgical experiences

**Table 3.** Number of Surgeons Requesting Additional Experience With Injury Types Falling into Discipline and Traditional Curriculum of General Surgery

Injury type	Surgeons*	
	n	%
Mediastinal trauma	59	43.1
Extremely vascular	52	38.0
Mesenteric vascular	44	32.1
Inferior vena cava injury	38	27.7
Pulmonary trauma	38	27.7
Retroperitoneal hematoma exploration	35	25.5
Liver hemostasis	33	24.1
Duodenal injury	28	20.4
Pancreatic injury	25	18.2
Fasciotomy	20	14.6

\*Respondents are allowed to choose more than one answer. (Reprinted from Tyler and colleagues<sup>57</sup> with permission from Wolters Kluwer Health Inc.)

they would request on completing their tours. Hemorrhage control at difficult anatomical sites and mediastinal and thoracic injury management topped the list. Of note, almost 15% requested additional experience with fasciotomy! These findings suggest flaws in preparation for the front-line surgeon and perhaps infer less than adequate confidence in these young surgeons to face the difficult cases from battle (Table 3).

The preparation of the surgeon certainly goes deeper than a predeployment course or courses. Most surveys and opinions reveal that these surgeons requested additional training because GME surgical training did not prepare the surgeon for the battlefield, as the diversity of cases, especially challenging cases (extremity and torso vascular, neurosurgical, burns, thoracic), in combat had not been encountered in residency or other nondeployed settings. A second reason for requesting additional training was that the surgeon reported a long time lapse since treating these types of cases, further supporting the need to provide combat-focused clinical experiences near deployment time. Several papers confirmed the observations with our own military trainees, that most forward surgeons treated traumatic brain injury, performed neurosurgical procedures, and treated burned children.<sup>14,57,59</sup> The impact of war-zone injuries and conditions on women and children is well documented, as are the considerable commitment of time and resources, and the physical and emotional challenges in treating them. A British paper that summarized the surgical workload of a 2-year experience at Camp Baston by a forward trauma team of general and orthopaedic surgeons confirms the American experiences.<sup>14</sup> It is not surprising



**Table 4.** Classification of Surgical Procedures

Procedure	No. performed	%
Trauma and general surgery		
Debridement torso	44	6.5
Laparotomy	106	4.8
Thoracotomy	31	1.4
Vascular	25	1.1
Minor surgery (nonemergency, nonbattle injury)	75	3.4
Emergency nonbattle injury, predominantly incision and drainage	84	3.8
Orthopaedics		
Debridement limbs	607	27.4
Application of external fixator	63	2.9
Amputations	85	3.8
Insertion of skeletal traction pins	24	1.1
Fasciotomy	46	2.1
Split thickness skin graft	46	2.1
Delayed primary closure	394	17.8
Hand surgery	142	6.4
Manipulation under anaesthetic	56	2.5
Head and neck surgery	139	6.3
Neurosurgery	39	1.8
Burns	104	4.7
Civilians		41
Pediatric		14.7
Battle injuries		93
Emergencies		51

(Modified from Ramasamy and colleagues<sup>14</sup> with permission from Elsevier.)

that additional exposure to pediatric surgery and burn care was prominent on a list of needs for those returning from war (Table 4).

Several studies called for standardizing predeployment training and adding prospective efficiency metrics.<sup>27,61</sup> In addition, customizing the curricula and making courses military-focused to assure the skills and competencies for treating the injuries on the battlefield were recommended. These military courses should be improved with advanced operative and open techniques, as well as damage-control orthopaedics and neurosurgery skills.<sup>61</sup> Courses and predeployment training should be adaptable to the needs and deficits of the individual surgeon. The British papers recommends extending the deployment experiences to trainees.<sup>14,59</sup> The wide-ranging and intense immersion by their trainees at the role 3 facility in Afghanistan presents a compelling argument to put trainees in general surgery and orthopaedics into these environments to greatly augment postgraduate training.

The answer to where these skills are best learned and refreshed continues to be at a very busy civilian urban Level I trauma center. Reports starting in the 1990s confirm that, when staffed and structured correctly, these intense immersion clinical experiences provide a vibrant and effective environment for providers to learn new skills and refresh proficiencies.<sup>64</sup> Those same reports support these environments for prehospital, allied health, nursing, special teams, physicians, and surgeons to acquire both individual and team training.<sup>26,65</sup> A more recent report favorably compares the caseloads, severity, and types of cases seen at the Center for the Sustainment of Trauma and Readiness Skills program in Baltimore with those of the role 3 US Air Force Theater Hospital in Balad, Iraq.<sup>66</sup> Although no civilian center can replicate the case load or wounds of the battlefield, this study concluded that the intensity of high injury severity cases, shock, and exposure to a high volume of soft tissue cases and debridements offers the closest approximation. In a report from a US Marine Corps Shock Trauma Platoon, at a less intense Level I trauma center, benefit was subjectively recognized and valued by the authors.<sup>67</sup>

Recently, the Rand Corporation studied how best to maintain military medical skills in peacetime and recommended stationing military teams in civilian trauma centers settings where the case mix resembles the case mix when deployed.<sup>49</sup> This will be more fully explored in “The Rand report” section.

We completed the survey of military-affiliated physicians in late 2014 to acquire current data from surgeons recently and currently deployed. We selected the EAST group because we knew that the group was large, had completed tours in roles 2, 3, 4, and 5 military facilities, and many had experienced several deployments during the previous 13 years. Most respondents had completed fellowship training by 2014 (>90%) and, compared with previous surveys, had the potential to bring the perspectives of those whose current careers focused on trauma, emergency surgery, and critical care both in and out of the military.

Of the 86 surveys fully completed and returned, service representation was 50% Army, 23.3% Navy, 20.9% Air Force, with a few individuals having served in two of the services. The group was further categorized into active duty, reserve, separated, and retired; active duty personnel accounted for 29.1% and reserve, separated, and retired each 26.6%, 22.1%, and 20.9%. Two surgeons served in the National Guard. There was a wide geographic distribution of respondents across the United States, with more concentration in more populace states and in larger metropolitan areas. Texas, Maryland and DC, California, Florida, and Oregon had the most respondents; 89.5%

**Table 5.** Experience at Deployment (n = 86)

At the time of your first deployment...	
How old were you? (y)	36*
How much surgical experience did you have?	
<1 y	24.1
1 to 2 y	29.1
Total for <2 y	53.2
3 to 5 y	25.3
6 to 8 y	6.3
>8 y	15.2
During your first deployment, were you stationed with another surgeon?	
No, I was the only surgeon	23.7
Yes, they were my contemporaries	14.5
Yes, there was at least one surgeon with more experience but no combat experience	21.1
Yes, there was at least one surgeon with more operating room experience and more combat experience	22.4
There were many experience surgeons, but I was the most experienced	18.4

\*Age expressed in median years, with an interquartile range of 33 to 39 years.

practiced medicine in an urban environment and 94.1% practiced in a trauma center and the vast majority (>90%) were in academic centers or community teaching hospitals. More than 90% had completed a fellowship, the most common being trauma and surgical critical care, followed by trauma and another general surgery fellowship, or trauma and vascular surgery fellowships.

To establish how busy these surgeons were with trauma, they were asked them to estimate the number of trauma resuscitations and trauma operations they performed per month in their current nondeployed environments. Almost all were quite busy with resuscitations, with separated and reserve surgeons as busiest, with a larger percentage performing >25 resuscitations per month. Trauma operations were also frequently performed by all categories: active duty, reserve, separated, and retired surgeons. The questionnaire allowed characterization of deployments and experience at the time of deployment. In addition, we sought information accompaniment if they were stationed with other surgeons when deployed or deployed as the only surgeon (Table 5). Of note, the median age reported at the time of the first deployment was 36 years and 53.2% reported having <2 years of surgical experience when first deployed; 23.7% deployed alone; and only 22.4% were accompanied or had a more experienced combat surgeon stationed with them.

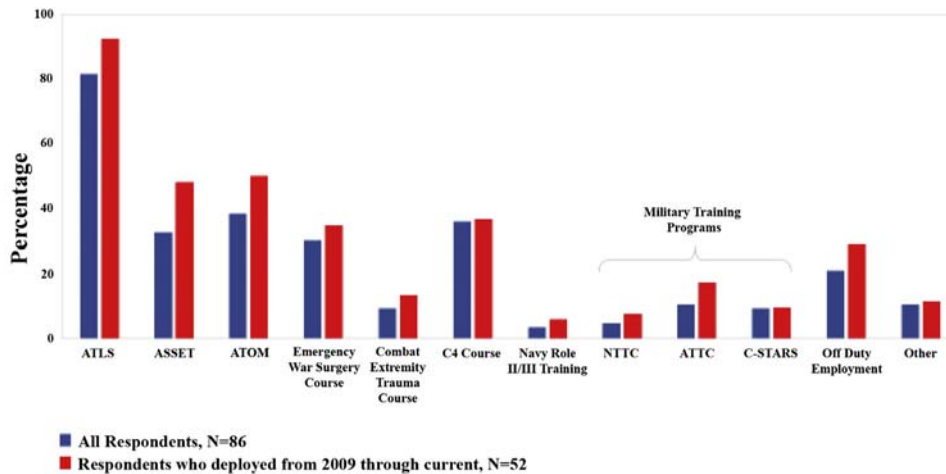
In reference to predeployment training programs, there was a wide distribution of civilian and military courses

attended. The highest attendance (approximately 80%) was an ATLS course, followed by All Source Satellite Evaluation Tool, Advanced Trauma Operative Management, and the Emergency War Surgery Course, with 30% to 40% attendance at these courses. Of note, attendance at one of the national military trauma training centers (Los Angeles, Miami, or 3 US Air Force Center for Sustainment of Trauma and Readiness programs) was minimal, with only a few individuals completing these more intense programs. This pattern of predeployment training experiences lasted the entire period of the war and no change was seen when the war years from 2009 to 2014 were examined (Fig. 3).

In a series of questions designed to characterize the surgical practice patterns when at home and in combat, the surgeons were asked to scale the frequency of performing 28 procedures using a Likert scale (1 to 5; never, seldom, occasional, frequently, and very frequently). A comparative analysis was then performed to quantify the change in frequency by procedure between home and deployed practice. This was also analyzed in the active duty and reserve groups, n = 47). These two groups of surgeons are the surgical readiness force. Their effectiveness relies on sharpened skills at all times. Procedures such as fasciotomy, amputation, craniotomy, lateral canthotomy, and urologic procedures increased in frequency. In particular, vascular techniques, such as peripheral bypass, shunt, or repair and control of junctional hemorrhage, increased significantly (Table 6). Laparotomy and thoracotomy appeared to be performed more frequently, but the difference did not reach statistical significance.

To understand how to optimally train and retain surgical skills for future conflicts and what professional factors would influence continuing of military service, the responses of all 86 surgeons were analyzed. In terms of how to effectively sustain skills, there was almost universal support for achieving this at civilian academic medical and trauma centers as full-time surgical faculty and staff for clinical practice and as trainers for rotating military trauma teams. More than 85% of the respondents believed this model to be effective and attractive. A second level of support for skill maintenance was assignment to a military treatment facility with periodic rotation to a civilian AMC or trauma center for clinical practice and training and coordinating military trauma teams (approximately two-thirds of respondents) (Fig. 4).

The group was then asked to characterize what they believed were the important elements that must be present in a civilian AMC or trauma center to train military trauma teams (Fig. 5). High-volume penetrating injury, ability to practice semi-independently, subspecialty individual training, and mentoring for procedures were believed to be the most important by >80% of the respondents. A second tier of important factors, team



**Figure 3.** Predeployment training programs (Eastern Association for the Surgery of Trauma questionnaire). ASSET, All sources Satellite Evaluation Tool; ATOM, Advanced Trauma Operative Management; ATTC, Advanced Trauma Training Course; C-STARS, Center for the Sustainment of Trauma and Readiness Skills; NTTC, national trauma training center.

training, and maintaining team integrity, individual attendance options, presence of a military dedicated curriculum, and presence of military faculty, cadaver and simulation training, and avoidance of conflict with GME trainees was highly valued.

In addressing other factors that might influence staying in the military, full-time assignment to the AMC or trauma center as staff and trainer rated the highest and was followed by continuing medical education or travel

support, larger financial bonuses, research support, and ability to work part-time at the AMC or trauma center for skills sustainment (Fig. 6).

In questions about overall preparedness of the operative team and trauma team, 47.4% believed the operative team was not prepared and 56.8% indicated they believed their trauma team was not prepared. These findings raise considerable concerns about the inadequacy of preparation of these critical interdisciplinary teams, and communicate a requirement to develop experiences that assure optimal execution and outcomes (Fig. 7).

This survey reinforces the need for a new skill set for the combat surgeon that draws from several surgical subspecialties. All military-affiliated surgeons, and especially the core specialists required to rapidly deploy, need training and sustainment of combats surgical skills.<sup>14,61,65,68-70</sup> It appears that a constant and intense experience in a busy Level I trauma center with full-time military faculty and a curriculum for both the surgeon and TCCC team constitute the preferred learning platform.<sup>49,66</sup> Last, assignment of the military trauma surgeon into a civilian AMC or trauma center as academic faculty and into staff surgical positions appears to provide the best model to assure skill proficiency and potentially attract surgeons to longer-term military service.

**The rand report**

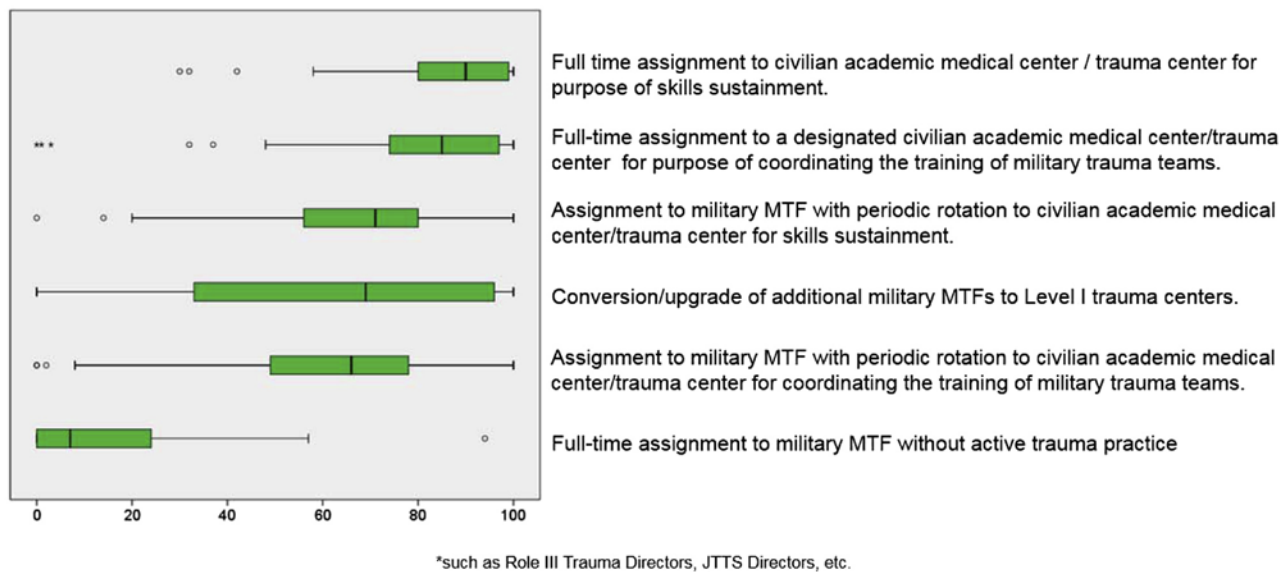
The Rand Corporation, in response to a request by the DOD, assessed and recommended a new paradigm for

**Table 6.** Differences in General Practice Patterns of Active Duty Surgeons and Reservists\* Between Operating at Home Compared With Operating in the Combat Theater

Procedure	Change from home to combat	p Value
Damage control (eg, laparotomy, sternotomy)	No change	NS
Fasciotomy	Increased	<0.001
Amputation	Increased	<0.001
Emergency airway management	No change	NS
Vascular	Increased	
Peripheral bypass	Increased	0.030
Peripheral shunt or repair	Increased	<0.001
Control of junctional hemorrhage	Increased	0.008
Urologic procedures	Increased	<0.001
Neuromonitor placement	Increased	0.027
Craniectomy or craniotomy	Increased	<0.001
Lateral canthotomy	Increased	0.038

\*n = 47 surgeons (25 active duty, 22 reservists). NS, not significant.

Indicate the level of efficacy for skills sustainment for MILITARY TRAUMA / CRITICAL CARE SURGEONS\* and other personnel that might be responsible for functioning as core cadre for the military trauma system during future conflicts.



**Figure 4.** Opinions about sustaining combat surgical skills (Eastern Association for the Surgery of Trauma questionnaire). MTF, military treatment facility.

maintaining the operational readiness of the DOD medical force.<sup>49</sup> Rand advised an expanded model of permanent stationing of military trauma teams in civilian settings (trauma centers) where the case mix resembles the case mix when deployed. In addition, the “safety net hospitals” were suggested as potential sites, as these hospitals provide a disproportionate share of trauma and emergency care.

The review analyzed the most frequent diagnoses related to care at a military treatment facility and those treated when deployed. A previous US Air Force report concluded that only 3.6% reported a diagnosis related to war.

The 2008 report concluded that there is a significant gap between the skill set needed for treating TRICARE beneficiaries at a military treatment facility (conditions of aging and obstetric care) and during deployment (wounds, fractures, and acute conditions), and this poses considerable challenges to maintaining readiness.

They tested a “willingness to accept” model of placing 12-member trauma teams into civilian trauma centers where they would spend 8 months at the civilian center and 4 months deployed or returning to the military treatment facility. Nine civilian health care organizations were interviewed and there was an overall positive response with little concern about liability and the disruption of the 4-month deployment cycle. Human resources and personnel policy questions arose with concerns about

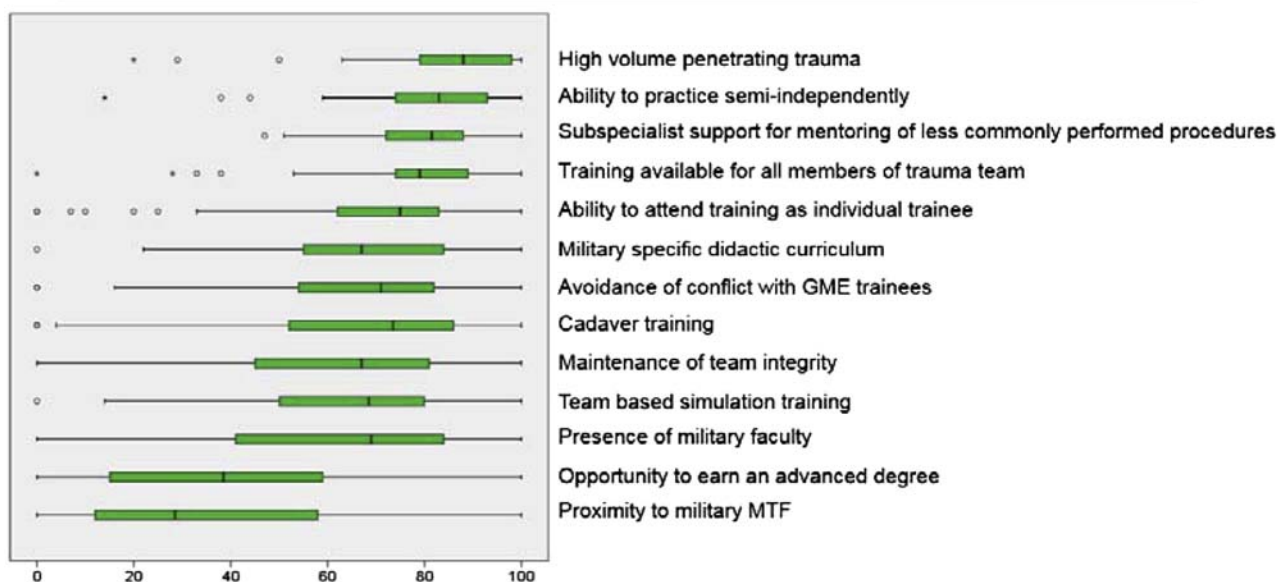
who has authority to discipline, fire, or relocate within their health systems, as well as financial structuring. Only one of the organizations interviewed, a fire department, did not foresee being able to accommodate military personnel due to a strong union presence and the perception that the union would oppose the influx of “discounted” labor. All other organizations were more optimistic about partnering with the DOD.

The report goes on to discuss the potential advantages and disadvantages. The apparent advantages for the partnerships for the DOD are improved flexibility, maintenance of clinical skills, and improved recruitment and retention. Disadvantages were the monetary costs of the DOD and some desire to use the military personnel in ways that do not align with the readiness mission. Occupational mix was a concern, as some organizations were interested in the DOD supplying specialists they need vs those needed by the DOD (eg, general and orthopaedic surgeons and anesthesia providers). Of note, these 3 physician specialties had exceeded end strength requirements and remained the core focus for the Rand model. Overall, no issues were believed to be insurmountable and the civilian organizations indicated optimism and flexibility, with a willingness to negotiate about specifics and interest in exploring cost sharing models.

The recommendation was to conduct a pilot study of 5 to 7 civilian trauma centers to access readiness, retention,



Assuming that a civilian academic medical center / trauma center was going to offer military trauma team training, indicate the most important elements.



**Figure 5.** Important characteristic of civilian and military training centers (Eastern Association for the Surgery of Trauma questionnaire). MTF, military treatment facility.

and morale. The report also proposed a new paradigm of military provider: active duty personnel sustained in a civilian sector for readiness (Fig. 8). In conclusion, Rand recommended developing the model at several centers would afford the DOD the best way to assess the mutual benefits to the military and civilian sectors; test the ability to improve clinical skills; and study the effect on recruiting, morale, and retention.

In my subsequent interviews with the leadership at the national trauma training center and several of the military faculty stationed at them as the military trainers, these concerns about personnel issues and human resources were rare in occurrence. The senior civilian leaders complimented the positive relationship between the military commands; the few issues that could be recalled were adjudicated rapidly and cooperatively. As to the nonmonetary disadvantages raised during the Rand interviews, none materialized. Most military physicians stationed as military faculty were from the 3 core specialties and deployment to rural facilities was not requested.

### Current military civilian trauma training centers

Currently and throughout the last 15 years, 5 national military civilian trauma training centers have been operational for the Army, Navy, and Air Force. These civilian and military learning platforms are structured on partnerships with several of the United States' medical

universities, have embedded military surgeons, and 8 to 12 interdisciplinary medical trauma teams stationed in these medical centers as full-time staff. The clinical work of the military teams is performed at the AMC's Level I trauma centers, where the military trauma team members are full-time faculty and employees. The financial and business arrangements appear to be acceptable to both the hospitals and the DOD. Licensing and credentialing, in later years, has been less problematic and malpractice insurance coverage provided according to national, state, and local requirements.<sup>27,57,61,66</sup>

There are a few reports on the actual activity of these centers, however. A rough estimate might show that thousands of military providers experienced various lengths of training time (2 to 4 weeks) at 1 of the 5 centers. At their prime (early and mid-war years), the centers were staffed for ongoing 4-week trauma didactic and clinical experiences for National Guard, reserve, and active duty surgeons and trauma teams.

Anecdotally, those interviewed praised the experience. In most years, the predeployment trainees benefited from the assignment of experienced and more senior combat surgeons as military faculty at the training centers. Of greatest impact for the military personnel was the heavy case load and exposure to massive injury and death that most trainees had never experienced. In addition, the civilian surgeons have served as ongoing

Indicate the likelihood of each of the following in terms of influencing your desire to continue military service.

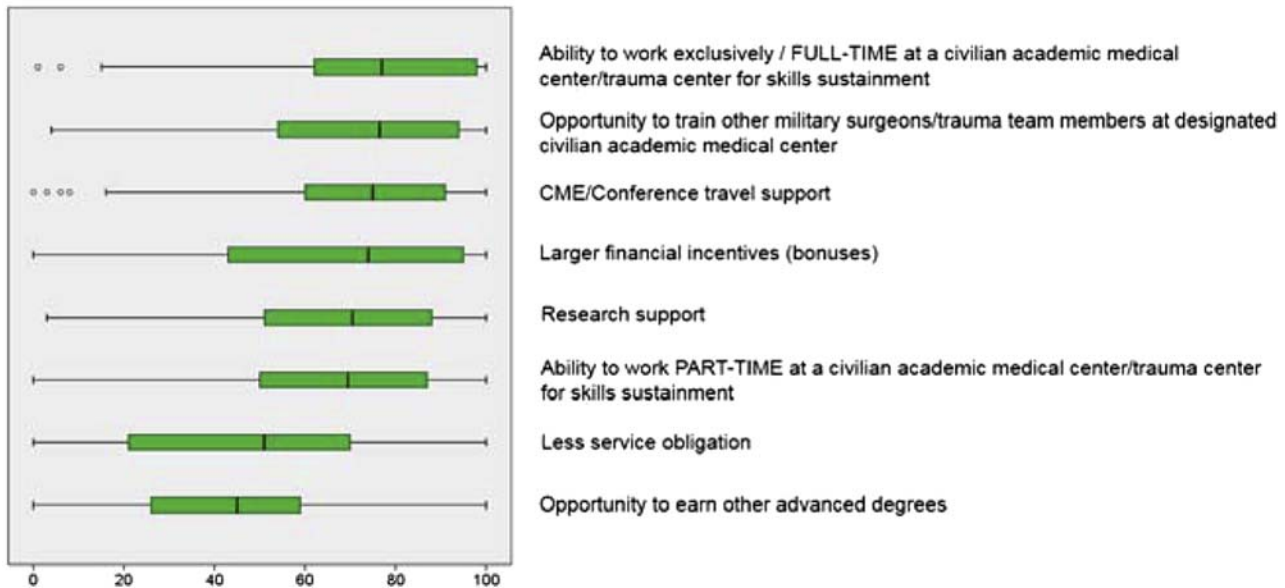


Figure 6. Factors that would influence continuing military service (Eastern Association for the Surgery of Trauma questionnaire).

resources for younger military surgeons during and after their deployments. In many instances, the strength of these relationships is transformational for the military surgeon encountering the human destruction and death of battle.

Still the literature and interviews show that these centers have not been optimized for training, refresher skills enhancement, and team training. They appear out of the mainstream of military medicine and seem poorly valued “up the chain of command.” They lack consistent expert staffing by the military and, at times, the military trainers were required to deploy, leaving the center without a senior military trauma surgeon. The command

structure and organization for the center appears convoluted and of low position in the hierarchy under each service surgeon general. Although best practices and innovative methods of teaching have emerged at each site, there is no formal process to assure sharing and development between sites or with other DOD medical training programs.<sup>71</sup> Assignments to the centers for “just in time” deployment training, skill acquisition, or refresher training of surgeons and trauma teams appeared poorly coordinated within the individual service and across the MHS. To our knowledge, these programs have not been objectively assessed, verified, or evaluated (Table 7).

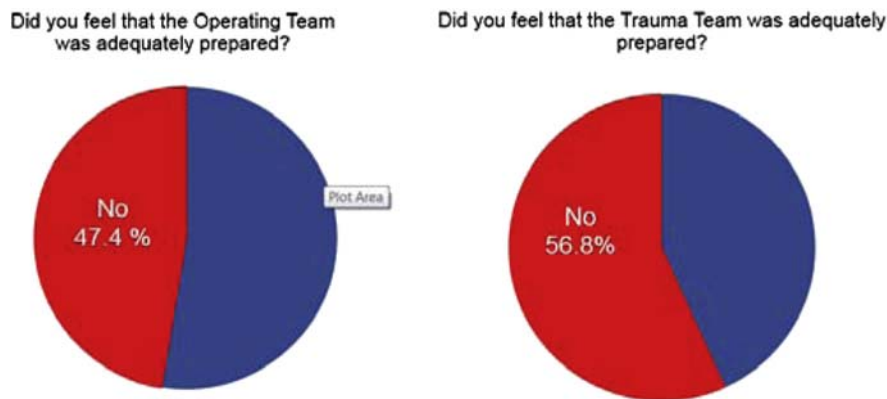
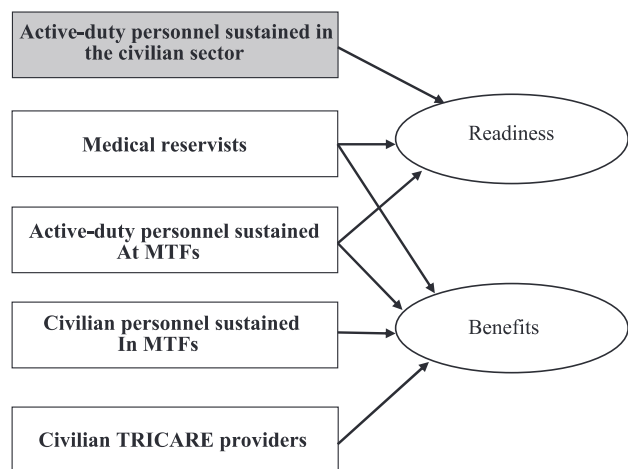


Figure 7. Eastern Association for the Surgery of Trauma respondents' opinions of preparedness of operating room and trauma teams.



**Figure 8.** The new paradigm adds a provider type. MTF, military treatment facility.

Although highlighting these shortfalls, the overwhelming opinions of those interviewed were that the experiences at these centers were “priceless.” Most interviewees gave examples of how the addition of the military enterprise promoted a greater mission of “doing good” far beyond the shores of America. These military and civilian partnerships created an attractive international platform for training of surgeons from countries where major trauma is infrequent or that lack the resources to train their trauma surgeons and providers. The centers have hosted and trained international teams and freely shared the lessons learned. This arena for advancing battlefield medicine appears to be an unrecognized diplomatic asset for the United States, with the potential for additional development as global trauma training resources.

### Civilian trauma center analysis

The analysis for the nation’s busiest trauma centers and those with an preferred case load and profile yielded a large number of centers with the potential for a military trauma training center and academic-military-civilian combat casualty care trauma training and research centers<sup>44</sup> (Fig. 9). The map demonstrates the centers with  $\geq 2,500$  admissions plus  $\geq 175$  injuries from firearms (gold circles). In addition, these municipalities had an American Burn Association burn center and pediatric hospital. The yellow circles represent those centers that, on further profile, were believed to be additional potential sites based on unique volume criteria, academic productivity, and faculty experience (military and civilian). Some of these centers do not participate in NTDB and others were placed in this category because they did not

fulfill the penetrating injury volume criteria or lacked an American Burn Association approved burn center or pediatric hospital, but admitted a very large number of trauma patients. In those that lacked the burn center or pediatric hospital, most had a clinical service for both with burn and pediatric surgeons, respectively. In addition, we observed cities where 2 trauma centers individually did not meet the maximum criteria ( $\geq 5,000$  admissions and  $\geq 300$  gunshot wounds), but in combination afforded the best overall experience for the military surgeons and teams. The model of deploying the military trauma team to a home-base AMC and credentialing them to provide clinical care at several centers (trauma, burn, and pediatric) has not been explored by the military. This model would provide greater exposure and experience for the spectrum of cases seen during deployment and improve access to experienced military-affiliated faculty and key faculty who might not be housed in one center. The creation of a civilian trauma theater would also add opportunity to further activate the military teams for mass casualty incidents, involvement in disaster planning, and clinical response, simulating the mass casualty incidents of the battlefield. Geographic distribution and linkage to safety net hospitals appears favorable, except in the north central United States. A more in-depth analysis should be conducted by the JTS and DHA.

### RECOMMENDATIONS

The recommendations of this White Paper focus on the following key areas: developing enhanced civilian military training platforms; creating a new military surgical specialty: the “combat surgeon”; establishing a permanent Readiness Command in the DHA and DOD; and reforming a military-civilian “think tank” to advise readiness and military surgery.

### The contemporary combat surgeon

Our civilian and military partnership should immediately develop a “new” type of trauma surgeon: the military surgeon, combat designated (the combat surgeon). The skills toolbox should address the needs identified during wartime and be designed to deliver an expanded set of competencies to deal with massive injury and bleeding, as well as emergency and essential surgery in remote, austere, and international locations. This curriculum and competencies will need to be crafted from several surgical specialties, including vascular, thoracic, orthopaedics, neurosurgery, pediatric, burn care, and others. Military, logistics, and team training would need to be incorporated at all levels.

**Table 7.** Current Military Civilian Training Centers, Interviews, Visits, and Literature

Strengths and benefits	Challenges
Personal commitments of the combined staffs and leaders	Use: not well coordinated, who goes: interval with deployment
Ongoing and shared sense of mission	Lack of a common curriculum
Large numbers attended	Lack the rigor of an academic program
Active duty, reserve, National Guard	No external assessment
Physician, nurse, and allied health professional teams	Best practices informally shared
Positive impact (subjective)	Convoluting command structure
Best practices emerged	Uncommon team to take call together
Mutual benefit to military and civilian centers	Cycle of military trainer deployment
Cross pollination, clinical and scholastic	Military faculty changeovers
Provided research potential	Not joint training sites
Military group (trainers) are honed for readiness response...	Poorly valued "up the chain of command"
Deployed and homeland	

A new multiyear fellowship to follow general surgery residency, incorporating these recommendations, should be established. The existing framework of the trauma and acute care surgery fellowship of the American Association for the Surgery of Trauma can be used, but adapted for battlefield conditions, needs, and combat delivery systems. Fellowship training sites should be selected from highly competitive and capable hospitals within civilian theaters that assure success. Where possible, these training programs should capitalize on combat-experienced leaders in surgery, nursing, and allied health professions currently populating the medical centers of North America. Ideally, these fellowships also would assure concentrated burn care and pediatric surgical and trauma experiences. It will be important to obtain endorsement by civilian program directors, specialty boards, and resident review committees. All programs would be overseen and assessed by the JTS and key academic departments of Uniformed Services University of the Health Sciences.

### Responsibility for trauma combat casualty care readiness

The Joint Trauma System should be elevated to Center status and moved up in the organizational structure of the MHS and DHA as a Center of Excellence. This Center should be positioned so that it reports directly to the Director of the DHA and has a strong connection to the leadership of the Uniformed Services University of the Health Sciences. As a "readiness center" it needs to have the responsibility and authority to create policy, standards, and accountability concerning all aspects of TCCC. Its commander should be qualified, experienced, and accomplished to assure success in both the civilian and military medical "worlds" and hold the appropriate rank for the importance of this new center. Obviously, it should be funded and staffed at a level to assure success.

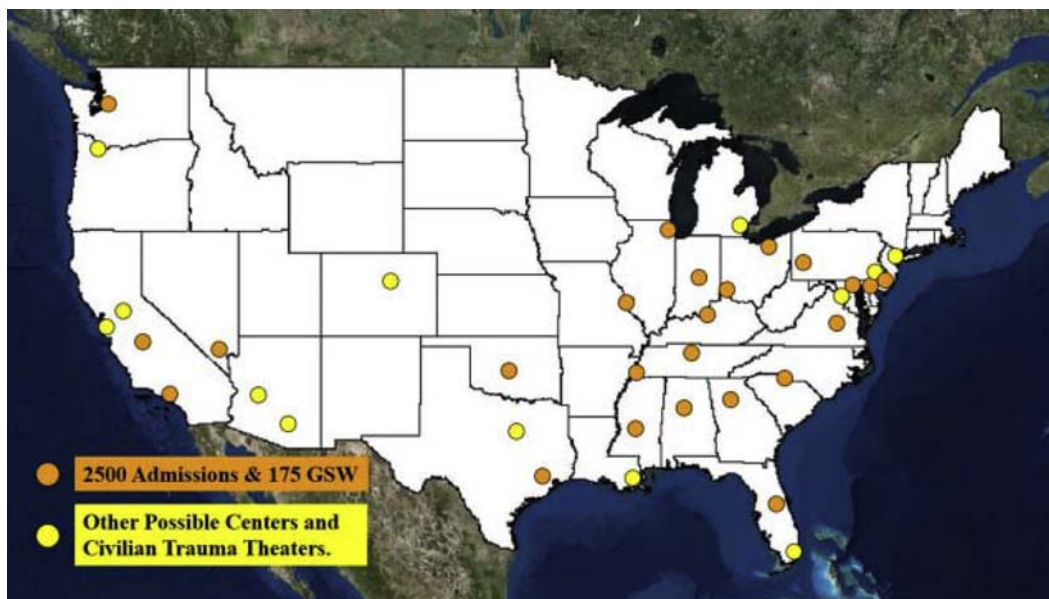
### Civilian and military trauma combat casualty care learning platforms

Developing an enhanced model for the training of rapidly deployable surgeon-led TCCC teams is critical. Such combat-ready surgical teams are analogous to the "special operations" teams of the Armed Forces, with this new model benefiting from the information and experiences of "special ops" commands and training structures. The surgeon-led TCCC incident teams should be embedded in our busiest civilian AMCs and large teaching metropolitan trauma centers. Academic and teaching centers should be selected based on volume, acuity, and profiles to assure adequate and continuous exposure to critical injury; clustering of patient arrivals; high-level, innovative education systems; and productive interdisciplinary research units.

These academic-military-civilian combat casualty trauma training and research centers would form a national network under the DHA and coordinated by the JTS Center of Excellence. The center would have a permanent assignment of military trainers and staff, along with trainees providing additional staff, faculty, and personnel for the partner trauma programs. Combined military and civilian staff would serve as faculty and trainers for an improved flow of surgeons and TCCC teams from all aspects of the MHS and triservices. In addition, the permanent military teams would be available to learn with and supplement the staff of other centers within a regional health and emergency network in the "home region" and for mass casualty and disaster management.

Ideally, these centers would be located at safety net hospitals that also fulfill the volume, educational, and research requirements developed by the JTS. Incorporating these additional resources in these stressed hospitals appears to benefit all parties and has potential to promote strong federal, regional, and local political support as a key value-added argument to support any future appropriations from Congress.





**Figure 9.** Geographical distribution of potential trauma training centers and civilian trauma “theaters” for an expanded network of academic-military-civilian combat casualty trauma training and research centers. GSW, gunshot wounds.

This model capitalizes on the lessons learned at the existing trauma training centers. All would be Joint training centers and provide experiences for active duty, reserve, and National Guard. The curriculum, skill set, and competencies of both individual and team competencies would be standardized across the sites. Courses, skill sets, and competencies would be developed from the data of the DOD Trauma Registry, informed by the military civilian think tank, and validated by the JTS. These learning platforms and the academic-military-civilian combat casualty trauma training and research center network would adopt the approach of a continually improving trauma system, making periodic adjustments as new information is learned and integrated from pre-hospital, hospital-based and rehabilitation, and re-entry phases of care. An ongoing and vibrant assessment program would assure that goals were achieved and improvements initiated at individual sites and across the networks of sites.

Sites at university centers would also develop access to postgraduate training and graduate degrees in science, business, leadership, and education for military participants. The military would benefit from having sites enabled to train vital individuals and the TCCC teams for rapid response, as well as providing medical and nursing leaders with more permanent civilian faculty appointments. The benefits of such further education and academic prestige also would be transferred back to their respective corps and DOD.

### Need for civilian military medical think tank

This review suggests a strong need to re-establish a think tank of senior civilian consultants to take on the larger and more difficult issues for the readiness and surgical mission of the DHA DOD.<sup>6-8,72</sup> These “subject content experts” (consultants) should be organized in accordance with government statutes, but structured to assure relevance, impact and value. This think tank should be composed of the best thinkers in academic surgery and medicine, health administration, finance, and economics.<sup>73,74</sup>

An oversight CCC board composed of military and civilian members would assure ongoing development, value and assessment of the academic-military-civilian combat casualty trauma training and research center network and program. The board also would advise Uniformed Services University and other training commands in the education of military students and trainees across disciplines. Although the recently formed DOD and ACS group has the potential to initiate the first board and render expert advice and direction, authority and responsibility would need to remain with the offices of the MHS and DHA<sup>75</sup> (Hoyt DB, “Military Health System strategic partnership with the American College of Surgeons,” charter document, internal communication, October 2014).

### SUMMARY ACTION POINTS

1. Expand and reframe the model of military civilian trauma training platforms. Increase the number of

national trauma centers to 10 to 12 academic-military-civilian combat casualty trauma training and research sites at America's best medical universities with full-time military faculty and staff integrated into the culture, organization, and clinical services of the AMC and the academy of the university and academia.

2. Create a new surgeon with expanded skills. Develop a "new" type of trauma surgeon: military surgeon and combat designated (the combat surgeon), with very broad skill set and competencies demanded on the battlefield and for the humanitarian mission of military surgery.
3. Elevate the JTS to a Center of Excellence for combat casualty care readiness. Recommend the DOD, Joint DHA, Service Chiefs, and key civilian experts (designated subject matter experts) collaborate and immediately take the necessary steps to protect and expand the readiness capabilities of the DOD MHS.
4. Create a think tank. Establish a civilian military medical think tank for sustained high-level problem identification and solutions focused on readiness and combat casualty care, system development training, education, and research.

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## Invited Commentary



M Margaret Knudson, MD, FACS  
San Francisco, CA

It is an honor to be afforded the opportunity to comment on this white paper by C William Schwab, MD, FACS, summarizing his Scudder Oration on Trauma, delivered at the 2014 American College of Surgeons (ACS) Clinical Congress. Dr Schwab's leadership in and dedication to the care of the injured, both in and out of uniform, are unparalleled, and the "Winds of War" article will be widely cited for years to come. During his year-long preparation for the Scudder Oration, Dr Schwab used several modalities to gather data. First, he performed an in-depth review of the published literature on current battlefield care. Next, he collaborated with the Military Ad Hoc Committee of the Eastern Association for the Surgery of Trauma in surveying the membership regarding their recent military service (including active duty, separated, and reserve surgeons). Additionally, he conducted personal interviews with individuals in leadership roles in academic medical centers as well as in the military. Finally, he completed an in-depth evaluation of the current status of trauma centers in the United States. Based on his extensive research, he provides us with several

recommendations that can only be accomplished through transparent military-civilian collaboration and with recognition of our shared ethos.

This military-civilian surgical bond has been greatly enhanced in recent years by the creation of the Senior Visiting Surgeon (SVS) program jointly sponsored by the ACS Committee on Trauma, the American Association for the Surgery of Trauma, and the Department of Defense. The SVS program allowed experienced civilian trauma surgeons to actively participate in caring for the critically wounded service members who were evacuated from the battlefields in Iraq and Afghanistan to the Landstuhl Regional Medical Center in Germany. Although initiated by trauma surgeons, other specialty surgeons including vascular, orthopaedic, and neurosurgeons, who were happy to donate 2 to 4 weeks of their time as civilian volunteers, quickly emulated this program. A recent summary of the 7-year SVS program documented that 200 trauma and vascular surgeons volunteered their services.<sup>1</sup> It is particularly fitting that Dr Schwab was the first Senior Visiting Surgeon and he helped to set the stage for the rest of us to follow.<sup>2</sup>

In his article, Dr Schwab provides direction in sustaining these civilian-military collaborative efforts, beginning with the recognition that military surgeons have a unique imperative: "to provide combat casualty care." He suggests developing a new fellowship for the combat surgeon that would include not only trauma and critical care training but would also incorporate certain elements of other specialties needed for deployment such as burn care, pediatric surgery, orthopaedic surgery, ophthalmology, vascular surgery, and neurosurgery. These skills could be sustained during intra-war periods by permanent military posts in busy urban, academic trauma centers. He further opines that the Joint Trauma System should be elevated to a Center of Excellence within the Department of Defense and maintain its tri-service structure. To oversee these major developments, Dr Schwab recommends establishment of a military-civilian think tank.

### THE WAY FORWARD: THE MILITARY HEALTH SYSTEM STRATEGIC PARTNERSHIP AMERICAN COLLEGE OF SURGEONS (MHSSPACS)

During the same Clinical Congress in 2014, David Hoyt, MD, FACS, ACS Executive Director, and Jonathon Woodson, MD, FACS, Assistant Secretary of Defense for Health Affairs created a historic partnership between the Department of Defense and the ACS with the signing of the MHSSPACS treaty.<sup>3</sup> The Leadership Group of the MHSSPACS was subsequently formulated to include key military personnel as well as leaders of the various