Strategy Research Project

A Dedicated Army Medicine Trauma Care System

by

Colonel Stephanie A Kwortnik
United States Army Reserve

Under the Direction of:
Professor Charles Allen

United States Army War College
Class of 2017

REPORT DOCUMENTATION PAGE

Form Approved--OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From - To)*
01-04-2017	STRATEGY RESEARCH PROJECT	

4. TITLE AND SUBTITLE
A Dedicated Army Medicine Trauma Care System

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Colonel Stephanie A Kwortnik
United States Army Reserve

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Professor Charles Allen

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army War College, 122 Forbes Avenue, Carlisle, PA 17013

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution A: Approved for Public Release. Distribution is Unlimited.
To the best of my knowledge this SRP accurately depicts USG and/or DoD policy & contains no classified information or aggregation of information that poses an operations security risk. **Author:** X **PA:** X

13. SUPPLEMENTARY NOTES
Word Count: 6683

14. ABSTRACT

The Military Health System is challenged with two enduring missions, Soldier and beneficiary care, and deployment healthcare. Primal to the deployment health mission is the readiness and availability of trained trauma teams and a trauma system. The Department of Defense Instruction 6040.47 sets the policy to initiate a Joint Trauma System but fails to identify an enduring realistic training platform. A Sustained Readiness Model with civilian trauma centers is necessary to bridge the interwar gap for training. New hybrid component units may be an opportunity to support a trauma care training platform. In addition, expanding current recruiting and retention programs within the Critical Wartime Skill providers is essential to ensure trauma team availability. Lastly, building the trauma skills of all trauma team members with paramedic programs and advanced practice nurses will broaden and helps offset the capability gap in light of the enduring physician shortage. The effect will be to promote innovation in talent management in platforms for trauma team providers.

15. SUBJECT TERMS
Joint Trauma System, Trauma Training Sustainment, Critical War Time Skill

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. TELEPHONE NUMBER** *(w/ area code)*
UU	UU	UU	UU	29	

A Dedicated Army Medicine Trauma Care System

(6683 words)

Abstract

The Military Health System is challenged with two enduring missions, Soldier and beneficiary care, and deployment healthcare. Primal to the deployment health mission is the readiness and availability of trained trauma teams and a trauma system. The Department of Defense Instruction 6040.47 sets the policy to initiate a Joint Trauma System but fails to identify an enduring realistic training platform. A Sustained Readiness Model with civilian trauma centers is necessary to bridge the interwar gap for training. New hybrid component units may be an opportunity to support a trauma care training platform. In addition, expanding current recruiting and retention programs within the Critical Wartime Skill providers is essential to ensure trauma team availability. Lastly, building the trauma skills of all trauma team members with paramedic programs and advanced practice nurses will broaden and helps offset the capability gap in light of the enduring physician shortage. The effect will be to promote innovation in talent management in platforms for trauma team providers.

A Dedicated Army Medicine Trauma Care System

The primary purpose for the United States (U.S.) Military Health System (MHS) and Military Medicine is to sustain the fighting force.[1] The *National Security Strategy* (NSS) 2015 outlines the challenges that threaten U.S. security and prosperity, with the first priority noted to be the nation's defense from a catastrophic attack.[2] The *2017 Army Medicine Campaign Plan* nests within the overarching *National Military Strategy* and the NSS goals to provide a ready medical force to meet the security objectives of the NSS and the mission assigned to Combatant Commanders.[3] However, a capability gap in Force Protection exists with inadequate trauma team training and critical wartime shortages of physicians in inventory. These are enduring challenges for Army Medicine and the Joint Force. To meet this goal of Force Protection, the Department of Defense (DOD) needs a dedicated trauma system, or assured access to a quality trauma system, to adequately train military medical personnel to meet their wartime missions. The October 2016 DOD Instruction (DODI) 6040.47 and Joint Requirements Oversight Committee Memorandum have started to address the policy issues of a Joint Trauma System. Demonstrably, the MHS excels in ensuring the fighting force is physically ready to perform its varied missions and providing rehabilitation care following trauma. The MHS also includes a strong emphasis on beneficiary care for the family members of service members. Yet, both degrade the focus of Army Medicine on its wartime mission of casualty care. This paper analyzes the current readiness and training programs for Army Medicine's trauma teams. This paper will limit the examination to the current state of trauma care and the capacity of the Active Army and Army Reserve to support wartime trauma care capability. Lastly, recommendations for changes will be proposed to mitigate this capability gap.

Background

American history is replete with examples of the advancements in the science of trauma care with the lessons gained during conflicts. Some examples of military medical innovations include the Civil War's creation of Regimental Surgeons and a national network for medical evacuation trains and hospitals.[4] Another historical illustration from World War I defined and embraced casualty care triage; World War II marked the beginning of the battalion aid station; the Korean War saw the establishment of the helicopter ambulance unit; and the Vietnam War followed with advance hemorrhagic damage control surgical techniques.[5] Nevertheless, for the First and Second World Wars, and conflicts in Korea and Vietnam, the U.S. pulled experienced civilian medical surgeons and providers into military service and afterwards returned them to the civilian sector. The lessons and evidence from trauma care subsequently were introduced into the civilian setting and changed trauma care as practiced in the U.S and abroad.[6]

Such innovations are practiced today with the common aim to provide care to the injured as close as possible to the time and point of injury to improve patient outcomes. However, history also has offered humbling evidence that the trauma lessons are lost between wars. Indeed, the "Walker Dip" cycle continues as described by United Kingdom's Military Health Systems Medical Director, Alasdair Walker.[7] The cycle (Figure 1) reflects that medical lessons are learned, lost, and relearned over time using data from WWII to military operations of today in Iraq and Afghanistan.[8] The opportunity exists to shape the future of trauma care through civilian partnerships to sustain trauma care proficiency. To align with this desired goal, Army Surgeon General, Lieutenant General Nadja West published the Army Medical Vision, which describes the approach

to maintain lessons learned, provide leadership on medical capabilities and conduct training under realistic conditions.[9]

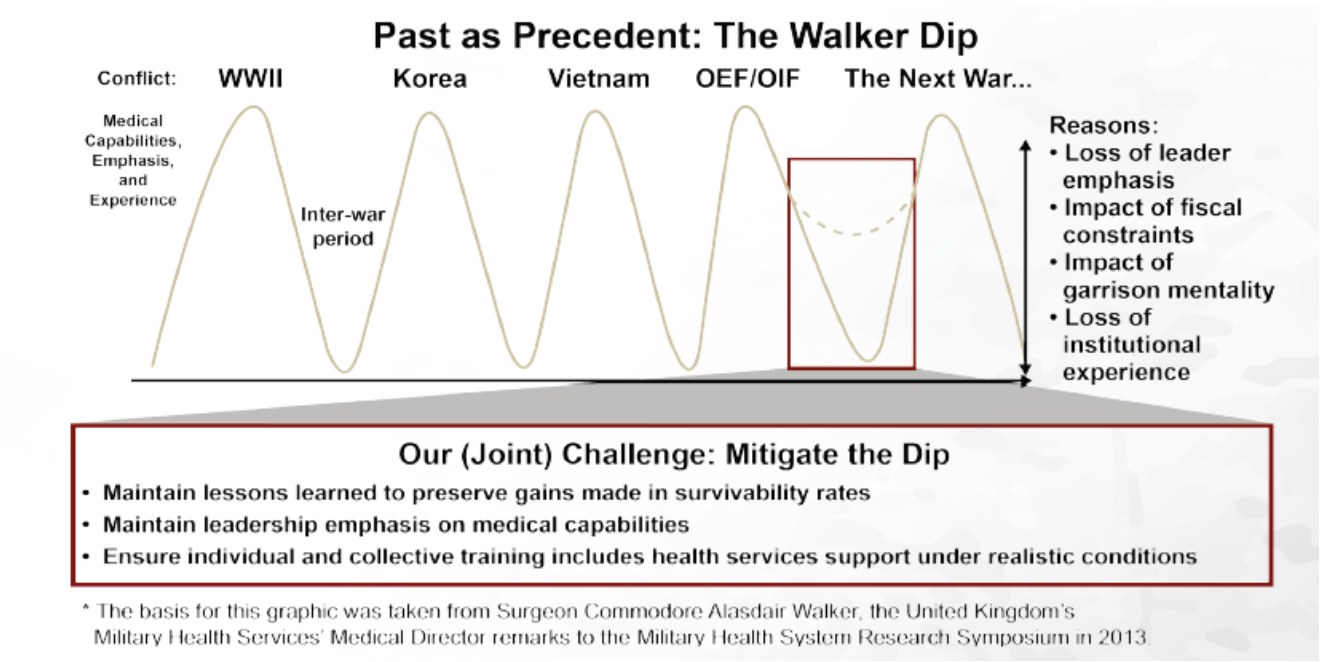

Figure 1. Past as Precedent: The Walker Dip[10]

The National Academy of Science, Engineering and Medicine's (NASEM) *2016 National Trauma Care System (NTCS) Report* states one in five U.S. military deaths after injury from trauma could be prevented if the U.S. had a better National Trauma Care System, ultimately a result of the military's lack of a dedicated trauma system.[11] Accordingly, NASEM proposed a NTCS as an opportunity to build a learning organization for trauma care and it should applied to address the U.S. military medical capability and capacity, which are currently lacking and underutilized.[12] In a learning care system as an application of Senge's *Fifth Discipline*, the communication cycle provides a forum for open communication across levels.[13] The *Trauma Care System* learning model could include all aspects of care from point of injury to recovery. The NASEM Report recommendations include shared best practice guidelines and quality

improvement process, team education and training blending military, and civilian trauma centers.[14] According to Senge, organizational learning requires creating the environment where people can grow and have a worthy purpose, which drives their commitment and fosters transformative relationships.[15] Medicine is a profession of life-long learning. The military trauma teams need a model of partnership with the civilian trauma environment to support this training under realistic conditions.[16] The military trauma teams need access to trauma environments to bridge the gap in practice and training. To date the Army has some examples of this such as the Miami Army Trauma Training Center (ATTC) under the Army Medical Command (MEDCOM).

The MHS is positioned to harness the learning system model. In September 2016, the DODI 6040.47 directed the establishment of a Joint Trauma System (JTS) with three primary elements: a trauma registry, a lead agent Military Health System and Defense Center of Excellence (DCOE), and an integrated Combatant Command Trauma System.[17] This creates a Training and Doctrine Command style framework for the Defense Health Agency, meaning the JTS-DCOE is positioned to be an organization that designs, acquires, builds, and improves future Army trauma care.[18]

Expanding care to meet the American College of Surgeons (ACS) trauma care system criteria may be a challenge as it is based on the demand of the public health sector. Moreover, while the MHS has excess capacity for general care, it could expand its capacity for trauma care. This seems unlikely considering trauma centers across the U.S. are competing to sustain the adequate trauma patient cases necessary for quality outcomes. Currently, the ACS only recognizes one military treatment facility in DOD as a level-one trauma center.[19] Level-one trauma centers are the highest level of care with

the most resources and highly trained trauma care teams. This is one of the three primary reasons why access to a dedicated trauma system is critical to the mission of Army Medicine. Several factors play a critical role in a trauma care system like access to a high volume of trauma patients for sustainment training, a trauma team workforce and team performance measures, and outcome data.

Trauma Care in American Civilian Health Care

A trauma care system is a coordinated, continuum of integrated care from point of injury to rehabilitation.[20] The ACS has oversight authority in the U.S. for verifying organizational levels of trauma care. The verification from the ACS is a robust evaluation process and includes an assessment of current practice, policies, guidelines, benchmarks and outcomes that facilitate performance analysis across the trauma care system.[21] This is an example of an organizational learning system model. Also, the system links resources regionally across the U.S. to ensure optimal patient care and provides trend data to drive evidence-based trauma prevention programs. Part of the trauma system includes the National Trauma Data Bank, which is a voluntary registry that collects aggregate trauma data and produces outcome reports allowing for performance improvement processes based on nationally recognized benchmarks.[22] Another process to become a designated trauma center is for a state to designate a trauma center to meet a geographic need, based on a public health assessment.[23]

The civilian trauma workforce trains continually to ensure readiness through clinical residencies, fellowships, team training, case reviews and simulation exercises. Most civilian trauma surgeons complete a fellowship at a level one-trauma center. Nurses and allied professionals often work for a year in emergency departments before starting training in trauma. On average nurses are mentored and receive one on one-

trauma training for 8-12 weeks in addition to their basic unit training. Based on the complexity of the care environment, this one on one- training could be four months long before independently working in a trauma setting. The American Hospitals Regulatory Agency for Healthcare Research and Quality has set the standard for medical team training based on validated assessment tools.[24] Major medical centers and level-one trauma centers frequently have simulation centers for team-based training particularly for high-risk, low-volume practice scenarios and team communication exercises. One illustration is "Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS), which is an evidence-based set of teamwork tools aimed at optimizing patient outcomes by improving communication and teamwork skills among health care professionals."[25]

Trauma Care in the Military Health System

The primary objective of military medicine is to sustain the fighting force as historically 30-50% of all wounded have been returned to duty after injury in combat.[26] Military medicine's two principal responsibilities are the "readiness" to support the armed forces during military operations, and member benefits or occupational health of the force and service members.[27] The MHS has a primary care system with excess capacity to meet the needs of the service members and their families.[28] Nevertheless, the MHS fails to adequately sustain and train for casualty care during peacetime due to the lack of access to trauma patient populations.[29] Years of analysis by primarily RAND Corporation on the MHS have demonstrated the gaps in capacity, inefficiencies in training, and limitations of trauma care opportunities for critical trauma team members.[30]

The Joint Theater Trauma System, now referred to as the Joint Trauma System (JTS), was established in 2004 and created a system for in-theater care coordination,

clinical standard guidelines, data collection, and evaluation and replicates the civilian model of a trauma care system.[31] As part of the JTS, the Institute of Surgical Research (ISR) established the Senior Visiting Scholars program, which brought civilian experts as educators and mentors to Germany and the operational theaters during the ongoing wars. In addition, the ISR established evidence-based clinical practice guidelines for trauma that are now nationally and internationally recognized. However, this system is designed and implemented for deployable units only and does not apply to the MHS at large. Through its operation, the JTS collected compelling data. This outcome data demonstrated its effectiveness in implementing force health protection changes in real time and helped create the JTS requirement in the *National Defense Authorization Act* (NDAA, Sec 707) 2017. Based on the successes of the JTS, the NDAA mandates the development of a civilian military trauma-training platform to mitigate the gap in trauma care in military medicine. To date, a trauma care system does not exist in the MHS, thus creating a capability gap in Army Medicine.

The military does not recognize critical care board certification and trauma specialties like the civilian medical profession. Specially trained critical care and trauma teams have been identified as the link to improved patient outcomes and now requires individuals to complete a training fellowship to work in this area in civilian healthcare.[32] However, unlike the civilian trauma system, which requires a facilitated clinical training period, the military trauma workforce is notably different as non-specialists provide trauma care.[33] The military is not alone in struggling to address critical shortages in trained and certified teams. Hence, the MHS must look to partner with institutions that have a sustained quantity of trauma patients especially in the interwar years like today.

Case in point, two-thirds of military surgeons that deployed for the first time do so before completing a trauma fellowship.[34] For example, of 280 trauma-trained surgeons, across all services, only 30 (10%) were able to deploy in 2012.[35] For the military nursing and allied health professionals there is no trauma residency or cross training for the most part. However, in limited cases the military has partnered with civilian trauma centers. For example, the University of Miami, Jackson Memorial Hospital, Ryder Trauma Center collaborated with the Army and helped to establish the ATTC.[36] The ATTC program is the only specialized program that evaluates performance in real time before mobilization.[37] Part of the ATTC program uses objective measures to validate team performance. Some of the standardized processes are TeamSTEPPS, Simulation and individual patient case reviews."[38] Yet, only a fraction of the trauma teams have access to the training at ATTC unless their units are in a mobilization status. In review, a military trauma workforce must have an environment conducive to supporting the wartime clinical skill.

Critical War Time Skill Shortage

Building and sustaining the trauma team workforce is equally as important as access to a trauma care system environment. Without a comprehensive trauma team, the outcomes for casualties are adversely affected.[39] The complex problem of the U.S. shortage of physicians has resulted in limitations to access of care and this shortage is reflected in the military.[40] Since the inception of the Army Health Services Command in 1973, now the Army Medical Command, the U.S. military across all services has only filled the requirement for physicians less than half of the time.[41] The reasons for the shortages across the U.S. are related to population growth, unchanged academic throughputs, and millennial lifestyle preferences.[42] The military has not been active in

talent management to balance the gains and losses of physicians.[43] The top five primary shortages in the medical command are surgeons (General, Cardio-thoracic, Vascular and Oral Maxillary Facial) and nurse anesthetists.[44] These groups of Critical War Time Mission (CWTM) providers are absolutely vital to providing trauma care. The Army Medicine campaign plan outlines the key operations of readiness with the aim to recruit and retain medical professionals.[45] To align within this objective, the medical deployable units must address the enduring problem of the CWTM shortage.

The current shortage of surgeons is a significant concern. The two issues related to the shortage are recruiting and retaining surgeons and sustaining trauma skills, which are most frequently not a part of their civilian practice skill set. In a recent root-cause analysis, Deputy Surgeon General U.S. Army Reserve, Major General Margaret Wilmoth determined initial entry, onboarding, and talent management are the major areas of opportunity to improve.[46] Due to the shortage, the deployment rate for surgeons of CWTM skills is 2.5 times more than for the average Soldier.[47] The mission demands directly impact retention of such qualified medical professionals.[48]

In past wars, physicians were directly recruited, assessed, and commissioned to serve to meet the operational requirements. Since the inception of the Army Medical Command after the Vietnam War, the military has been unable to sustain its CWTM.[49] Incentives and special programs have yet to be effective. The key elements identified in the research for recruit and retain techniques include competitive pay incentives, promotion during medical training, and pay for time in service during training.[50] To date, the amount of signing-on and retention bonuses for active duty military physicians have

increased over 50% in the past ten years but this is still below the civilian market compensation.[51]

In a recruiting and retention survey of physicians, results suggest they join the military to serve for patriotic reasons with 80% of physicians coming from scholarship programs.[52] Of note, the scholarship doctors stay in uniform on average three years compared to nine years for the United States Uniformed School of Health Sciences (USUHS) physicians.[53] The evidence of USUHS graduates staying longer supports assimilation and influences of doctors' commitment to the military profession. This opens the opportunity for further discussion about expanding the capacity at USUHS to include future physician and nurses for the Reserve component, given the national shortage of physicians in both the military and civilian sectors. Moreover, adding capacity to USUHS may create a larger supply of trauma providers. Other recruiting platforms could include civilian-military staffing models similar to disaster preparedness activations or humanitarian response missions. This recruiting platform would require creating and maintaining a database of available and proficient trauma workforce members. To date, the limited access to trauma patients, and trauma care systems as well as the shortage of physicians play a role in the lack of a military trauma care system.

Leadership and Team Performance

In a learning organization as in a trauma care system, the trained team requires trauma patients and outcome data to determine team effectiveness. Positive outcomes derived from trauma care systems data are a direct result of the trauma team providing quality care.[54] The Joint Trauma System Registry only collects data from combat casualties in theater and the major military medical centers, (e.g., Walter Reed National

Military Medical Center, San Antonio Military Medical Center and Landstuhl Regional Medical Center) which receive patients from theater.[55] Unlike the ACS National Trauma Registry Bank, the military does not collect trauma data other than war-related casualties. The ACS guidelines recommend data collection of patient outcomes as well as the trauma team training and performance.[56] The absence of objective metrics as the benchmark for patient outcomes and quality across the care continuum, and team performance is a contributing factor in a critical gap in the military's current trauma system.[57]

The MHS has an exemplar of leadership in medical care that embraces the learning system model. San Antonio Military Medical Center (SAMMC) employs the Army Management Framework-SMART strategy, which stands for: specific, measurable, achievable, results-focused and time-bound.[58] The leadership at SAMMC routinely looks at accreditation, safety, cost, quality, and patient satisfaction through concurrent data in a learning and transparent manner. However, this is the exception, and not utilized throughout the MHS. Whether evaluating patient outcomes or team training, data are required to be analyzed and re-evaluated in a learning organization and the lack of data is part of the problem. Case in point, the Defense Health Board recognized that a key lesson learned from the past wars in Iraq and Afghanistan was the need for a robust monitoring system for the purpose of performance improvement and outcome tracking.[59]

Leadership and unity of command are an influential factor in trauma team success. Under the Mission Command philosophy, Commanders must built cohesive teams and ensure their units are flexible, trained and adaptive in a complex

environment.[60] The best example of command ownership is the 75th Ranger Regiment, part of the Special Operations Command. A former Regimental Commander, then-Colonel Stanley McChrystal, mandated tactical trauma care training, data collection and a quality performance process.[61] This resulted in the Ranger Regiment having the lowest death rate (died of wounds and killed in action rate) of all of the Department of Defense during the wars of Iraq and Afghanistan. Moreover, while the DOD experienced a 25% preventable death rate for casualties who made it to a treatment facility, the 75th Ranger Regiment had less than 1% potentially preventable death rate from 2001-2010.[62]

In the analysis thus far, the gaps in the military trauma care system are rooted in several causes. The lack of a trauma system is ultimately a result of the scarcity of training platforms with a Sustained Readiness Model (SRM) and standardized objective measures to evaluate training effectiveness, critical team shortages, and inconsistent quality leadership.[63] The co-dependence of access to a trauma patient population in the interwar period cannot be separated from the necessary training platform. With all this considered, the MHS is failing to sustain and train military healthcare providers for their wartime tasks of trauma.[64]

One University of Pennsylvania trauma surgeon and veteran, Dr. Jeremy Cannon, confronts the misperception of the military meeting the demands of skilled and ready trauma care providers. Cannon claims the military medical corps is untrained and does not have a system to adequately provide trauma training for the majority of the medical corps.[65] Moreover, he contends ‘just in time’ training is inadequate.[66] “Just in time” training programs such as the ATTC, provide a short clinical immersion for small

teams at one of three major trauma centers across the U.S. While this clinical immersion appears to be effective as a team confidence builder, the United Kingdom's General Medical Counsel has found it does not demonstrate skill retention.[67] More concerning is the realization that after trauma team training, the retention of the learned behavior begins to decline. In 2014, General Medical Counsel completed an analytical literature review on the correlation between time away from practice and skill deterioration. The United Kingdom study concluded skill acquisition declines most rapidly in the first months immediately after training and the decline is less rapid based on the overall years of continued performance.[68] Skill acquisition and retention varies but is estimated to degrade between 6 and 12 months depending on the skill and individual.[69] This gives more impetus for sustainment training in an environment that offers access to trauma patients and a trauma care system.[70]

Recommendations and Risks

A DODI 6040.47 Directive for a Joint Trauma System Defense Center of Excellence creates the basis for a joint military trauma system in partnership with civilian trauma agencies. The goal is to embrace the best practice of trauma care and create a military trauma system through coordination that is properly resourced and has a command structure for sustainability.[71] This directive appropriately focuses military combat casualty care on the core mission of ready and trained medical forces. In addition, the NTCS proposal from the NASEM is complex and embraces the best of military and civilian trauma systems. Similar to the post 9/11 when the Department of Homeland Security had to unify multiple agencies toward improved interagency communication and coordination, the NTCS presents a similar opportunity. In the

interim, Army Medicine can take action now to improve the current military trauma care system.

Redesign the Military Trauma Care System

The Army Medical Command Active Component (AC) is taxed with providing 24/7 Soldier and beneficiary care in addition to their wartime training mission. Hence, the competing interests leads to a failed strategy to lessen the capability gap for trauma care. One study noted the average infantry soldier is better prepared for combat mission than a military general surgeon.[72] With that said, the Army Reserve (USAR) mission is supporting the war fighter in combat and healthcare during the conflict. The USAR holds the majority of the MHS combat-deployable units.[73] Yet, the USAR continues to have a disproportionately lower number of training opportunities in comparison to the AC units.[74] In review of the lessons learned from the conflicts of the 21st century, the lack of unity across the leadership has resulted in inequities in trauma care training.[75] Up to 50% of USAR medical soldiers in deployable units do not work in healthcare or their military occupational specialty.[76] To mitigate the training gap, Medical Reservists employed in the civilian work force have facilitated ad hoc arrangements or memorandums of understanding with local civilian facilities to conduct training for their Army Reserve (AR) unit personnel. Individual battalion and company-size unit leaders often collaborate and take on this un-resourced program knowing the benefit it has to the mission for those AR personnel who do not work in their military operational skill area.[77] However, these programs understandably lack standardization, and sustainability.

Command leadership from the top down fails to recognize the importance of training, as it has not become a reportable metric of performance or resources.

Commanders are often focus on mandatory unit metrics and readiness reports, which have no relevance to the mission essential task list of patient-care performance measures. Instituting command readiness reports based on training performance with relevance to the trauma clinical practice guidelines, simulation performance and trauma benchmarks for clinical practice could be established through routine readiness reports. In summary, the military trauma system could establish and expand a SRM for civilian trauma care training through partnerships in trauma environments sharing best practice models from the USAR.

Enhance Military Trauma Team Training

The *Mission Zero Act* proposal to Congress is a bipartisan bill that would establish the preliminary grant funds for two programs aimed at civilian military collaboration in trauma training.[78] The first program establishes the necessary trauma team training for military health professional trauma care sustainment through embedded work across 20 high acuity trauma centers. The second program is a Military Trauma Care Provider Placement Program.[79] Medical providers would work side by side with the civilian trauma teams honing their trauma care skills and sharing military lessons learned from current theater deployments and ongoing military research. In the end, the ongoing wartime skill--trauma care training gap will necessitate new partnerships and training models.[80]

The training model needs a clinical immersion by the military personnel in high acuity civilian trauma centers similar to the required training in the civilian trauma system. This opportunity enhances the human dimension aspects, adding to the flexibility and adaptability of the healthcare providers to new and changing environments. Furthermore, the clinical immersion exposes the civilian centers to the

high-caliber medical personnel of the Armed Services. The clinical immersion model should be based on the providers' level of responsibility and have measurable objective to quantify clinical benchmarks. A reasonable clinical experience for a new military reserve service member in a high acuity area like the intensive care unit or emergency room would be similar to the civilian training with a utilization tour of at least 400-500 clinical hours of independent practice. This equates to a part-time employee of one day a week practicing in a high-acuity patient care environment. The active component utilizes a graduate nurse residency program. However, all surgeons and midlevel providers lack a trauma care fellowship or clinical emersion. The MEDCOM ISR Surgeon, Colonel Shawn Nessen suggests newly trained surgical resident would require two to three years to establish a trauma competency for independent theater war surgery.[81]

A Reserve-Active Component blended model breaks the tradition of the historical Active-Reserve models much like the blended Brigade Combat Teams or the Air Force Wing units. A Reserve unit led model could enhance the civilian military partnership by leveraging the relationships of the local soldiers, employers and the community. One test pilot for "proof of concept" recommended to civilian university medical centers to rotate active component soldiers to the major trauma centers for eight months and then sent them to theater for four months.[82] The results were overwhelmingly favorable to include the often-raised concern for legal issues and credentialing.[83]

Mitigate the Critical War Time Shortages (CWTS)

Addressing the dearth of progress over the past forty years in recruiting and retaining CWTS providers requires redesign and innovation. Current accession processes for trauma care providers includes, expanded graduate medical education

either through a commissioning service or via the USUHS. Surgeons enter the military system via one of the two options. Other licensed healthcare professionals enter through scholarship such as Reserve Officers Training Corps or direct commission. Allied health professionals enter through enlistment. New options for the CWTS providers needs to be explored. An option is a medical service registration or obligation for all eligible medical providers that attended U.S. medical schools. Establishing a process by obtaining baseline information for accessions and credentialing if called to serve could expedite the process for rapidly manning provider positions during a national crisis.

The talent management of the medical corps should be improved. Re-engineering the career path for CWTS providers is necessary. A model similar to an academic tenure program may retain surgeons by creating two career paths without the added challenge of leadership development, which is a distraction to their highly skilled clinical expertise. Physicians could access into the military and pursue a leadership track or opt to stay clinical. In addition, Reserve trauma team providers could work at level-one trauma centers as a part of their service duty on battle assembly weekends. Ultimately, Army Medicine needs to explore innovative human resource platforms that allow flexible entry and exit in order to recruit and retain CWTS professionals throughout the course of their careers. Expanding the Individual Military Augmentee model to include a recruiting of CWTS professionals directly into the Individual Ready Reserve may meet the need with less financial obligation.

Lastly, mitigating the gap of CWTS providers requires not only talent management initiatives but also a collective approach to strengthen the skill of the team.

One of the key factors in the 75th Ranger Regiment success was the increased skill level of medics to that of a licensed paramedic. Current pilot programs exist in the Army to increase a portion of medics to a paramedic training level.[84] Considering the medic is the second largest military operational skill in the Army, this is a promising strategy.[85] Additionally, the Army should explore utilization of the existing Acute Care Advanced Practice Nurse as part of the trauma team similar to the civilian trauma teams and U.S. Air Force and U.S. Navy.[86] Raising the skill level of the whole team increases the capabilities and helps offsets the trauma team deficiencies with the ongoing shortage of CWTS providers.

Develop Leadership and Track Team Performance

The strategic multiplier of medical readiness directly relates to the effectiveness of trauma casualty care teams. Poorly trained teams have poor outcomes, yet highly skilled teams as noted earlier with the 75th Ranger Regiment have significantly better outcomes.[87] Ultimately this equates to saving soldiers' lives. The "just in time" training model from the past Army Force Generation (ARFORGEN) model for medical teams does not sustain skill proficiency and team communications necessary to be operationally poorly effective when teams first arrive in the theater of war.[88] Trauma teams that communicate and lack care coordination have worse patient outcomes.[89] The Army's *Total Force Policy* command training guidance outlines building readiness through synchronization and resourcing processes, and designing and implementing the SRM to replace the ARFORGEN model.[90] Embracing a sustainment model requires leadership and a unity of effort to bridge the training gap with the military with the civilian setting where the trauma caseload is a constant in the interwar period.

Active and Reserve medical commands should be held accountable for training and meeting the JTS Trauma clinical practice guideline and establishing annual simulation training similar to the civilian trauma care system. The U.S. military should build on the knowledge and experience gained from the JTS. A JTS is recognized as a best practice model and some of the programs worthy of sustainment are the Senior Visiting Scholars program, and the Institute of Surgical Research established evidence-based clinical practice guidelines for trauma that are now nationally and internationally recognized.[91]

A SRM as applied to medical care and readiness will mitigate gaps in training, which will ultimately impacts patient outcomes.[92] An integrated creation of a military civilian model would allow for a continuum of care, which provides access to trauma patients and result in a more flexible, responsive, and competent medical force structure.[93] The ATTC is a model that could be replicated in other civilian level-one trauma centers to ensure the military healthcare service members practice and sustain their war time skills in a trauma rich environment.[94] Replication of this training platform requires leadership and a unified agency with the authority to coordinate and ensure a high level of care for trauma patients.[95] Also, expanding programs like the curriculum of the ATTS with simulation training centers creates a sustainable training environment for skill retention and utilization, especially in the Reserve where the majority of the deployable units are assigned.

Understanding the complexity of the existing Military Health System and Army Trauma System sheds light on the challenges the military faces to establish a comprehensive trauma system. The absence of a dedicated military trauma care

system in the U.S. hinders the ability of the MHS to save lives in both war and peacetime. However, the NDAA 2017 has provided a leverage point for the civilian military trauma collaboration. A new model for a dedicated trauma care system would affect training and education, the human capital dimension of the military with investing in our CWTS and civilian military relations. As demonstrated in the past, the military is positioned to create a best practice model with measurable outcomes redefining trauma care across both the civilian and military. The goal includes saving soldiers, beneficiaries and civilians, and increasing medical capabilities both at home and overseas. Additional gains to consider are recruiting and retaining medical and allied healthcare staff. Finally, investing in a dedicated system for sustained trauma care ultimately provides a strategic capability advantage to our national security with a ready and capable medical force.

Conclusion

The mission of the U.S. MHS is to sustain the fighting force.[96] This paper explored the current deficiencies of a dedicated trauma care system and discerned root causes associated with access to trauma care environments, the ongoing critical wartime skill provider shortage, and the paucity of trauma data to evaluate trauma care. Lastly, this gap in trauma training is a result of the absence of adequate and sustainable trauma training platforms, the lack of effective leadership, and the lack of reported and standard objective for trauma team performance measures. Recommendations to offset these capability shortcomings include redesigning the military trauma system, creating accessible civilian partnerships with level-one trauma centers, expanding innovation in talent management platforms for CWTS and increasing the trauma team providers' skill levels. The consequences of the gap in capability and the absence of a dedicated

trauma system create sizable risk for the forces provided to Combatant Commanders and charged with supporting the Nation's security.

Endnotes

[1] U.S. Department of Defense, *Health Service Support*, Joint Publication, JP 4-02 (Washington, DC: U.S. Department of Defense, July 26, 2012), 1-1.

[2] Barack Obama, *The National Security Strategy* (Washington, DC: The White House, February 2015), 3, https://www.whitehouse.gov/sites/default/files/docs/2015_national_security_strategy.pdf (accessed September 9, 2016).

[3] U.S. Army Medical Command, *2017 Army Medicine Campaign Plan* (Fort Sam Houston, TX: U.S. Army Medical Command, November 3, 2016), http://armymedicine.mil/Documents/Army_Medicine_2017_Campaign_Plan.pdf (accessed December 10, 2016).

[4] M. M. Manring et al., "Treatment of War Wounds: A Historical Review," *Clinical Orthopaedics and Related Research* 467, no. 8 (2009): 2168–2191, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2706344/ (accessed January 3, 2017).

[5] Ibid., 2169.

[6] Jeremy W. Cannon, "Military-Civilian Exchange of Knowledge & Practices in Trauma Care," 2016, 4, http://www.nationalacademies.org/hmd/~/media/Files/Report%20Files/2016/Trauma-Care/Knowledge-Practices-in-Trauma-Care-CP.pdf (accessed May 10, 2016).

[7] Robert L Mabry, "Challenges to Improving Combat Casualty Survival on the Battlefield," *Joint Forces Quarterly* 76 (December 30, 2015): http://ndupress.ndu.edu/Media/News/News-Article-View/Article/577593/jfq-76-challenges-to-improving-combat-casualty-survival-on-the-battlefield/ (accessed January 2, 2017).

[8] ibid.

[9] Nadja West, "Army Medicine Vision," November 2016, http://armymedicine.mil/Documents/Arm_Medicine_Vision.pdf (accessed January 20, 2017).

[10] Alasdair Walker, "Opening Remarks," public speech, The Military Health System Research Symposium: The United Kingdom's Military Health System Briefing, Washington DC, 2013.

[11] Donald Berwick, Autumn Downey, and Elizabeth Cornett, *A National Trauma Care System: Integrating Military and Civilian Trauma Care to Achieve Zero Preventable Deaths after Injury* (Washington, DC: The National Academies Press, 2016), 1.

[12] Ibid.

[13] Peter Senge, *The Fifth Discipline, The Art & Practice of the Learning Organization* (New York: Doubleday, 1990).

[14] Berwick, Downey, and Cornett, *A National Trauma Care System*.

[15] Senge, *The Fifth Discipline*, 262-264.

[16] West, "Army Medicine Vision."

[17] U.S. Department of Defense, *Joint Trauma System (JTS)*, DODI 6040.47 (Washington, DC: Office of the Under Secretary of Personnel and Readiness, September 28, 2016), http://www.dtic.mil/whs/directives (accessed January 19, 2017).

[18] *The United States Army Training and Doctrine Command Home Page*, http://tradocnews.org (accessed January 20, 2017).

[19] Cannon, "Military-Civilian Exchange of Knowledge," 17.

[20] The Committee of Trauma: American College of Surgeons, *Regional Trauma Systems: Optimal Elements, Integration, and Assessment, American College of Surgeons Committee on Trauma: Systems Consultation Guide* (Chicago: American College of Surgeons, 2008), vii.

[21] Ibid.

[22] *The American College of Surgeons Foundation Home Page*, https://www.facs.org/quality-programs/trauma/ntdb (accessed January 27, 2017).

[23] Ibid.

[24] *The Agency for Healthcare Research and Quality linked to Teamstepps Portal*, http://www.teamsteppsportal.org (accessed December 10, 2016).

[25] Ibid.

[26] John Holcomb et al., "Understanding Combat Casualty Care Statistics," *Journal of TRAUMA Injury, Infection and Critical Care* 60, no. 2 (2006): 398.

[27] Susan D. Hosek, and Gary Cecchine, *Reorganizing the Military Health System* (Santa Monica, CA: RAND, December 2001), 2.

[28] Nancy Nicosia, Barbara Wynn, and John Romley, *Assessing the Performance of Military Treatment Facilities* (Santa Monica, CA: RAND, 2011).

[29] Cannon, "Military-Civilian Exchange of Knowledge," 4.

[30] Christine Eibner, *Maintaining Military Medical Skills During Peacetime: Outlining and Assessing a New Approach* (Santa Monica, CA: RAND, 2008), 3.

[31] *Joint Trauma System Home Page*, http://usaisr.amedd.army.mil/10_jts.html (accessed January 19, 2017).

[32] Berwick, Downey, and Cornett, *A National Trauma Care System,* 93- 95.

[33] Ibid., 245.

[34] Ibid., 218.

[35] Ibid., 239.

[36] Linda Valdiri, Virginia Andrews-Arce, and Jasson Seery, “Training Forward Surgical Teams for Deployment: The U.S. Army Team Training Center,” *Critical Care Nurse* 35, no. 2 (April 2015): e13.

[37] Ibid.

[38] Ibid.

[39] Berwick, Downey, and Cornett, *A National Trauma Care System*, 56-57.

[40] Ohio State University, "Shortage of General Surgeons By 2010, New Research Projects," *ScienceDaily*, 2011, www.sciencedaily.com/releases/2008/12/081201105700.htm (accessed online January 21, 2017).

[41] Samuel Holmes et al., “Military Physician Recruitment and Retentions: A Survey of Students at the Uniformed Services University of the Health Sciences,” *Military Medicine*, May 2009, 530.

[42] Ibid., 530

[43] Benjamin F Mundell, *Retention of Military Physicians. The Differential Effects of Practice Opportunities across the Three Services* (Santa Monica, CA: RAND, September 2010), 1.

[44] Margaret C. Wilmoth, “Critical Wartime Shortage-GOSC,” briefing slides, Washington DC, Office of the Surgeon General, December 3, 2016.

[45] United States Army Medical Command, “The 2017 Army Medicine Campaign Plan,” November 3, 2016, http://armymedicine.mil/Documents/Army_Medicine_2017_Campaign_Plan.pdf (accessed December 10, 2016).

[46] Margaret C. Wilmoth, “Critical Wartime Shortage-GOSC,” briefing slides, Washington DC, Office of the Surgeon General, December 3, 2016.

[47] Ibid.

[48] Holmes et al., “Military Physician Recruitment and Retentions.”

[49] Ibid.

[50] Ibid., 534.

[51] Ibid., 530.

[52] Ibid.

[53] Ibid.

[54] The Committee of Trauma, *Regional Trauma Systems: Optimal Elements, Integration, and Assessment*, Systems Consultation Guide (Chicago: American College of Surgeons, 2008), 24.

[55] Karen O'Connell et al., "Evaluating the Joint Theater Trauma Registry as a Data Source to Benchmark Casualty Care," *Military Medicine*, May 2012, 546.

[56] Committee of Trauma, *Regional Trauma Systems.*

[57] Ibid.

[58] Thomas Spoehr, "Leading and Managing High-Performing Army Organization," *Military Review,* July 2016, 10.

[59] Defense Health Board, *Combat Trauma Lessons Learned from Military Operations 2001-2013* (Falls Church, VA: Defense Health Board, March 9, 2015), ES-5.

[60] U.S. Department of the Army, *Mission Command*, ADP 6-0 (Washington, DC: U.S. Department of the Army, May 2012), 1, http://usacac.army.mil/sites/default/files/misc/doctrine/CDG/cdg_resources/manuals/adp/adp6_0_new.pdf#page=8 (accessed January 6, 2017).

[61] Berwick, Downey, and Cornett, *A National Trauma Care System*, 56-57.

[62] Ibid., 56-57.

[63] Ibid., 1.

[64] Cannon, "Military-Civilian Exchange of Knowledge."

[65] Ibid., 2.

[66] Ibid.

[67] General Medical Council, United Kingdom, "Executive Summary: Skills Fade: A Review of the Evidence that Clinical and Professional Skills Fade during Time out of Practice, and of How Skills Fade May be Measured or Remediated," May 2014, 5, http://www.gmc-uk.org/Skills_fade_executive_summary.pdf_59101967.pdf (accessed December 20, 2016).

[68] Ibid., 5.

[69] Ibid.,4-5.

[70] Nicole Roberts, "The Impact of Brief Team Communication, Leadership and Team Behavior Training on Ad Hoc Team Performance in Trauma Care Settings," *The American Journal of Surgery,* February 2014, 170.

[71] Office of the Under Secretary of Personnel and Readiness, *U.S. Department of Defense Instruction 6040.47* (Washington, DC: U.S. Department of Defense, September 28, 2016), http://www.dtic.mil/whs/directives (accessed January 19, 2017).

[72] A. C. Beekley, "Preparing the Next Generation of Combat Surgeons," briefing, Washington, DC, January 15, 2015.

[73] Global Security Organization, "Military: US Army Reserve," http://www.globalsecurity.org/military/agency/army/usar.htm (accessed November 18, 2016).

[74] Harry Thie et al., *Enhancing Interoperability Among Enlisted Medical Personnel* (Santa Monica, CA: RAND Publishing, 2009), 43.

[75] Defense Health Board, *Combat Trauma Lessons Learned.*

[76] Thie et al., *Enhancing Interoperability among Enlisted Medical Personnel.*

[77] Cannon, "Military-Civilian Exchange of Knowledge."

[78] Congressional Documents and Publications, "Kirk & Burgess Introduce Bipartisan, Bicameral Bill to Improve Trauma Care with Military-Civilian Partnerships," *Federal Information & News Dispatch, Inc.*, September 2016, in ProQuest (accessed October 14, 2016).

[79] Ibid.

[80] Ibid.

[81] Shawn C. Nessen, U.S. Army MEDCOM, telephone interview by author, December 4, 2016.

[82] Christine Eibner, *Maintaining Military Medical Skills During Peacetime: Outlining and Assessing a New Approach* (Santa Monica, CA: RAND, 2008), 3.

[83] Ibid.

[84] Eve Meinhardt, "Partnership Allows Medics to Receive Paramedic Training," March 15, 2016, linked from the *United States Army Home Page,* https://www.army.mil/article/164244/Partnership_allows_medics_to_receive_paramedic_training/ (accessed February 24, 2017).

[85] Meinhardt, "Partnership Allows Medics to Receive Paramedic Training."

[86] United States Air Force, "Advanced Practice Nurses" linked from the *United States Air Force Home Page*, http://www.airforcemedicine.af.mil/Organizations/AFCCVO/Forms/Advanced-Practice-Nurse/ (accessed February 24, 2017).

[87] Berwick, Downey, and Cornett, *A National Trauma Care System*, 56-57.

[88] Roberts, "The Impact of Brief Team Communication."

[89] Ibid.

[90] Flem Walker, Jr. “Building and Sustaining Readiness across Forces Command Formations,” May 2, 2016, linked from the *United States Army Home Page*, https://www.army.mil/article/166101/Building_and_sustaining_readiness_across_Forces_Command_formations/ (accessed January 6, 2017).

[91] Berwick, Downey, and Cornett, *A National Trauma Care System*, 1.

[92] Ibid., 80.

[93] Ibid.

[94] Valdiri, Andrews-Arce, and Seery, “Training Forward Surgical Teams for Deployment.”

[95] Berwick, Downey, and Cornett, *A National Trauma Care System*, 78.

[96] U.S. Department of Defense, *Health Service Support*, Joint Publication, JP 4-02 (Washington, DC: U.S. Department of Defense, July 2012), 1-1.