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Trauma surgical skill sustainment at the University of Chicago AMEDD Military-Civilian Trauma Team Training Site: an observation report

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ABSTRACT

Background The Army Medical Department (AMEDD) Military-Civilian Trauma Team Training (AMCT3) Program was developed to enhance the trauma competency and capability of the medical force by embedding providers at busy civilian trauma centers. Few reports have been published on the outcomes of this program since its implementation.

Methods The medical and billing records for the two AMCT3 embedded trauma surgeons at the single medical center were retrospectively reviewed for care provided during August 2021 through July 2022. Abstracted data included tasks met under the Army's Individual Critical Task List (ICTL) for general surgeons. The Knowledge, Skills, and Abilities (KSA) score was estimated based on previously reported point values for procedures. To assess for successful integration of the embedded surgeons, data were also abstracted for two newly hired civilian trauma surgeons.

Results The annual clinical activity for the first AMCT3 surgeon included 444 trauma evaluations and 185 operative cases. The operative cases included 80 laparotomies, 15 thoracotomies, and 15 vascular exposures. The operative volume resulted in a KSA score of 21 998 points. The annual clinical activity for the second AMCT3 surgeon included 424 trauma evaluations and 194 operative cases. The operative cases included 92 laparotomies, 8 thoracotomies, and 25 vascular exposures. The operative volume resulted in a KSA score of 22 799 points. The first civilian surgeon's annual clinical activity included 453 trauma evaluations and 151 operative cases, resulting in a KSA score of 16 738 points. The second civilian surgeon's annual clinical activity included 206 trauma evaluations and 96 operative cases, resulting in a KSA score of 11 156 points.

Conclusion The AMCT3 partnership at this single center greatly exceeds the minimum deployment readiness metrics established in the ICTLs and KSAs for deploying general surgeons. The AMEDD experience provided a deployment-relevant case mix with an emphasis on complex vascular injury repairs.

BACKGROUND

The Military Healthcare Systems (MHS) is responsible for two separate, but intertwined tasks of assuring a medically ready force and a ready medical force. From a general surgery perspective, the first task focuses on providing the full spectrum of general surgical care. The second task is almost exclusively focused on providing combat casualty care. Relying on the day-to-day operations of stateside medical care within the MHS to maintain readiness for this second task, often leaves deployed surgeons reporting that they are in need of additional trauma-specific training.[1] While the causes of this perceived gap in knowledge and experience are likely multifactorial, the low volume of surgical cases and limited amount of trauma patients managed at military treatment facilities are two contributing factors that make it challenging for the MHS to address this knowledge and experience gap.[2 3]

Recognizing these competing mission requirements, the 2017 National Defense Authorization Act called for the expansion of military and civilian medical partnerships as a means of augmenting the trauma experience of the medical personnel. The Army has developed several different programs to offer flexibility in meeting this requirement. Among these programs is the Army Medical Department (AMEDD) Military-Civilian Trauma Team Training Program (AMCT3), which principally focuses on the Forward Resuscitative Surgical Detachments. Each military-civilian partnership has unique characteristics owing to the patient population of the civilian institution and variability in how the military structured involvement of their service members. As such, the present study characterizes the initial experience of a single AMCT3 partnership.

METHODS

The study is a retrospective review of the electronic health records and billing records and was deemed exempt from consent by the institutional review board. The study population consists of all newly onboarded trauma surgeons at a single institution that started in 2021.

The electronic health record was retrospectively reviewed to abstract the surgical case log and patient notes for all patient care rendered by the trauma surgeons from August 1, 2021 through June 30, 2022. The electronic health record was cross-referenced with billing records and, for the active-duty surgeons, the monthly reports of clinical activity to the AMCT3 program office to assure all patients and procedures were identified.

Skill sustainment was categorized using the Individual Critical Task List (ICTL) for Army general surgeons. The ICTL for Army general surgeons was revised in 2022, therefore, for continuity purposes

Table 1 Army ICTL procedures performed by individual surgeons at the University of Chicago

	AMCT3 #1	AMCT3 #2	Civilian #1	Civilian #2
Perform initial evaluation and resuscitation of trauma patient	444	424	453	206
Critical care management of a patient	192	151	197	90
Medical management of a patient with a severe head injury	63	56	61	27
Perform eFAST	416	345	–	–
Perform vascular exposure of the extremities, neck, chest, and abdomen	15	25	7	10
Perform vascular repair and/or placement of a shunt	20	17	13	3
Perform a laparotomy	80	92	68	46
Perform a thoracotomy	15	15	8	2
Perform a tracheostomy	7	10	3	3
Perform a fasciotomy	7	10	4	3
Perform a lateral canthotomy/cantholysis	0	1	0	0
Place a central line	4	18	10	6
Perform external fixation of a fractured extremity	0	0	0	0
Perform a definitive below the knee amputation	1	1	0	0

Data are presented as the total number of cases and/or procedures performed from August 1, 2021 through July 31, 2022. The total number of eFASTs performed was not able to be obtained from the medical or billing records and was obtained from the monthly reports sent to the AMCT3 program office by the individual embedded surgeons. Therefore, no eFAST data were available for the civilian surgeons.
AMCT3, Army Medical Department (AMEDD) Military-Civilian Trauma Team Training; ICTL, Individual Critical Task List.

the ICTL for 2021 was used throughout. Surgical cases in which the attending was listed as the primary surgeon, co-primary surgeon, or assisting surgeon were counted toward the case total. Bedside procedures performed by the attending surgeon or by a resident under direct, bedside supervision were counted toward the total number of procedures. Focused Assessment with Sonography for Trauma (FAST) scans are documented and coded under the emergency medicine physician and therefore it was impossible to determine the number of FAST scans interpreted by the trauma surgeon from the medical and billing records. However, the performance of FAST scans was able to be taken directly from the monthly reports of clinical activity to the AMCT3 program office and is therefore only reported for the active-duty surgeons.

The Knowledge, Skills, and Abilities (KSA) score for each surgeon was estimated based on the procedure group point totals described by Dalton *et al*.[3] For procedures with multiple current procedure terminology (CPT) codes, only the primary code was used for the estimate. When there was a question as to which procedure category a CPT best mapped to, the procedure category with the lowest assigned points was selected to avoid overestimates. The methodology for calculating the score has only been particular described, preventing a more accurate calculation.[3 4]

RESULTS

Four trauma surgeons were onboarded in 2021. Three were fully clinical (1.0 full-time employment (FTE)) and one split the time between clinical activities and research (0.7 FTE). All four were fellowship trained trauma surgeons.

AMCT3 surgeon #1 was 1.0 FTE clinical. The surgeon performed 444 trauma evaluations and resuscitations (table 1). This resulted in 185 operative procedures, including 80 laparotomies, 15 thoracotomies, 15 vascular exposures, and 20 vascular repairs and/or shunt placements. The total KSA score was 21 998 points.

AMCT3 surgeon #2 was 1.0 FTE clinical. The surgeon performed 424 trauma evaluations and resuscitations (table 1). This resulted in 194 operative procedures, including 92 laparotomies, 15 thoracotomies, 25 vascular exposures, and 17 vascular repairs and/or shunt placements. The total KSA score was 16 739 points.

Civilian trauma surgeon #1 was 1.0 FTE clinical. The surgeon performed 453 trauma evaluations and resuscitations (table 1). This resulted in 151 operative procedures, including 68 laparotomies, 8 thoracotomies, 7 vascular exposures, and 13 vascular repairs and/or shunt placements. The total KSA score was 16 738 points.

Civilian trauma surgeon #2 was 0.7 FTE clinical. The surgeon performed 96 operative procedures, including 46 laparotomies, 2 thoracotomies, 10 vascular exposures, 3 vascular repairs and/or shunt placements. The total KSA score was 11 156 points.

DISCUSSION

The AMCT3 program is part of the overall strategic partnerships between the Military Health System and its civilian counterparts. One of the objectives of these partnerships, as outlined in The Blue Book, is to train and sustain trauma skills with the implicit goal of maintaining deployment readiness.[5] Although there is no perfect standard to define surgeon readiness, two commonly discussed variables within the military community are the Army's ICTL and the KSA point total. Neither metric encompasses all aspects of a ready medical force, but both provide a measurable benchmark for establishing minimal thresholds for readiness.[4]

The Army's ICTL for general surgeons was developed through focused empiricism and has undergone several revisions since its inception. The ICTL includes categories of procedures and annual minimum case numbers for deploying general surgeons. Among the initial recommendations was that the surgeon perform 120 total surgical cases without limitations on the type of procedures. Through this partnership, the surgeons are able to meet this metric in just over 8-month time. Prior studies examining operative volume at Army medical treatment facilities (MTF) demonstrated that active duty operative surgeons averaged 108 cases per year, with approximately 20% exceeding 180 cases per year.[2] The operative volume experienced by both of the embedded surgeons places them within this higher performing category.

As anticipated, the AMCT3's principle focus on trauma resuscitation created a platform for active-duty trauma surgeons to

experience clinical volumes several folds higher than the annual operative volumes reported by the busiest trauma surgeons assigned to the Brooke Army Medical Center.[6] The partnered medical center experiences nearly a 40% rate of penetrating trauma annually with gunshot wounds being the primary mechanism of injury. Chicago is the third largest metropolitan city in the USA, and the medical center's proximity to the Southside of Chicago substantially and continuously creates clinical volumes above what is encountered at military treatment facilities. However, comparisons between partnered surgeons and an MTF are likely to have underestimated potential surgical volume in the MTFs as neither study was able to adjust MTF operative volume for individual surgeon's time deployed and in the present study the partnered surgeons were fenced off from deployment. Despite this limitation, it is still notable that it is possible to achieve a higher degree of specificity for cases that are directly combat related through a civilian partnership.

When considering specific categories of cases, a similar trend is seen. The recommended annual requirements included 10 open abdominal cases, 5 open thoracic cases, 2 vascular exposures, and 2 vascular repair or shunts. Partnered surgeons are able to greatly exceed these thresholds owing to the University's high operative volume and its high percentage of penetrating trauma cases. Particularly relevant is the number of vascular cases performed, as deploying surgeons have typically self-reported low levels of confidence with these procedures.[1] The relatively high volumes reported here have left both surgeons comfortable performing these procedures to the extent that one was recently deployed to fill the vascular surgeon position at the Role 3.

The KSA metric provides a second method for assessing surgical clinical relevancy for combat care and defining readiness. The metric converts CPT codes into a weighted value (points) that take into account the relative complexity of a case and its applicability and relationship to combat casualty care. A score of 14 000 has been recommended as the minimum threshold to define readiness for deployment.[4] While the basis of score development has been described, full details on how to calculate a KSA value have not been previously reported.[3 4] Using the limited details described in the recent report by Dalton *et al*,[3] the KSA point total for the AMCT3 surgeons suggest that this threshold can be met and/or exceeded in 6–8 months.

This AMCT3 partnership represents an example of the embedded sustainment model.[7] As such, the general surgeon experience is specific to this model. Reports from other Army embedded sustainment model programs are limited, however these also show that the partnerships represented an effective way achieving surgeon readiness.[8] In comparison, the short-term sustainment model focuses more on just-in-time training and team building with less ability to meet the proficiency metrics established in the ICTLs or KSAs.[9 10] While it may be tempting to try and compare the different models, the fact that they have different focuses should be taken into consideration as each serves an important role in individual and team combat readiness.

Within the embedded sustainment models, there is a potential for institutional variability from one center to another. In this particular study, the surgeons were part of a trauma and acute care surgery section that covers three different services: trauma, surgical critical care and acute care surgery. While the trauma service is exclusively covered by the trauma surgeons, responsibility for surgical critical care is shared with anesthesia critical care, and the acute care surgery is shared with general surgery. This results in approximately 75% of time being dedicated to trauma, 15% to acute care surgery, and 10% to surgical critical care. For those surgeons that were considered 1.0 FTE clinical these clinical responsibilities included 10–12 weeks per year running a service lines during the daytime (trauma, acute care surgery, or surgical critical care), 3–4 nights per month covering both the trauma and acute care surgery service line, and 2–4 backup shifts per month (24 hours).

During onboarding, the new trauma surgeon spends time on all three service lines with senior faculty available to provide mentorship as needed. The very first week of service is generally a full week of running the trauma service during the daytime and is taken paired with a senior partner. All subsequent shifts were taken independently. This onboarding process lasts approximately 2 months and often demonstrates a degree of variability in clinical experience based on the time of year that they join the practice (high clinical volumes and increased rates of penetrating trauma are experience during April through November).

In order to ascertain whether or not the embedded surgeons were being used in a different manner than their civilian counterparts, a comparison was made to the two civilian hires that started at roughly the same time as the two active-duty surgeons. These results demonstrate a fairly equivalent clinical experience for all three surgeons that were 1.0 FTE clinical. While the active duty surgeons had higher total cases volumes and higher KSA scores, this likely reflects differences in the case mix each surgeon experienced as the actual number of initial trauma evaluations and resuscitations was similar for all three. When considering the 0.7 FTE clinical surgeon, their experience was proportionally similar to the other three surgeons in all of these metrics as well.

While this report focuses on two military surgeons at a single institution, it is unable to answer which model of military-civilian partnerships is best for assuring military medical readiness. This report highlights that one of the advantages of an embedded model is that at the appropriate civilian institution, a military surgeon can achieve a high degree of exposure and experience managing complex trauma patients such that surrogate markers for readiness such as KSAs or completion of a service-specific task list are not necessary to assure competency. Additionally, the embedded surgeons were still able to support field training exercises and other medical training. They accomplished this without the typical concerns that such time away from the hospital may have a significant negative impact on readiness due to lost operative time. As a result, we believe this model should remain a part of the Army's overall readiness strategy with embedded surgeons spending 3–4 years at the partnered institution before rotating back to a military installation. Rotating surgeons out after a defined period of time would allow for a larger percentage of the surgeons to experience the benefits of these partnerships and allow them to have a greater impact on the overall medical force.

Our study has several limitations. First, it only reflects clinical activity. Ultimately, skill sustainment is about providing quality care and achieving optimal outcomes. Studying volume alone fails to account for the complexity that is required to achieve the best outcomes.[11] Next, this is a single-center study, and may not reflect the experience at other AMCT3 sites. Future studies are needed to evaluate all of the AMCT3 sites and each of the specialties involved to better characterize the return on investment from the program. Lastly, future studies should strive to incorporate outcome metrics to include how civilian care provided at AMCT3 sites influences the combat casualty care provided during a deployment.

CONCLUSIONS

The AMCT3 partnership provides a robust exposure to trauma patients. It offers a heightened focus on combat casualty care-relevant evaluation, resuscitation, and management of civilian patients. This clinical opportunity exceeds the minimum benchmarks for deployment established by the ICTL and KSA score metrics, by providing a more deployment-relevant case-mix and volume compared with the MHS standard. This partnership may represent a paradigm shift and new standard for military trauma training education and sustainment.

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