Oregon Health & Science University
School of Medicine

Scholarly Projects Final Report

Title *(Must match poster title; include key words in the title to improve electronic search capabilities.)*

AMCT3 Assessment Program

Student Investigator's Name

Jonathan Browne

Date of Submission *(mm/dd/yyyy)*

03/10/2022

Graduation Year

2022

Project Course *(Indicate whether the project was conducted in the Scholarly Projects Curriculum; Physician Scientist Experience; Combined Degree Program [MD/MPH, MD/PhD]; or other course.)*

Scholarly Projects

Co-Investigators *(Names, departments; institution if not OHSU)*

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Mentor's Name

Dr. Ownbey, Misha

Mentor's Department

EM

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Concentration Lead's Name

Dr. Nelson

Project/Research Question

What is the baseline trauma proficiency and level of improvement of medical servicemembers in the AMCT3 program

Type of Project *(Best description of your project; e.g., research study, quality improvement project, engineering project, etc.)*

Quality improvement

Key words *(4-10 words describing key aspects of your project)*

AMCT3, military, trauma, assessment, scenario, ATLS, Army CPG

Meeting Presentations

If your project was presented at a meeting besides the OHSU Capstone, please provide the meeting(s) name, location, date, and presentation format below (poster vs. podium presentation or other).

Publications *(Abstract, article, other)*

If your project was published, please provide reference(s) below in JAMA style.

Submission to Archive

Final reports will be archived in a central library to benefit other students and colleagues. Describe any restrictions below (e.g., hold until publication of article on a specific date).

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Next Steps
What are possible next steps that would build upon the results of this project? Could any data or tools resulting from the project have the potential to be used to answer new research questions by future medical students?

Next steps include trials of the scenarios and refinement of the scoring system

Please follow the link below and complete the archival process for your Project in addition to submitting your final report.

https://ohsu.ca1.qualtrics.com/jfe/form/SV_3ls2z8V0goKiHZP

Student's Signature/Date *(Electronic signatures on this form are acceptable.)*
This report describes work that I conducted in the Scholarly Projects Curriculum or alternative academic program at the OHSU School of Medicine. By typing my signature below, I attest to its authenticity and originality and agree to submit it to the Archive.

X _____

Mentor's Approval *(Signature/date)*

X _____

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Report*: Information in the report should be consistent with the poster, but could include additional material. Insert text in the following sections targeting 1500-3000 words overall; include key figures and tables. Use Calibri 11-point font, single spaced and 1-inch margin; follow JAMA style conventions as detailed in the full instructions.*

Introduction *(≥250 words)*

The Army Military Civilian Trauma Team Training program is designed to provide medical servicemembers exposure to more severe trauma and surgical patients than they typically experience in a military treatment facility. The injuries received by our soldiers overseas have a dynamic distribution with which our physicians must constantly be aware of and prepare for. Due to the diverse medical needs and injury patterns of patients presenting to emergency departments across all 50 states, our emergency physicians gain experience in an inequitable manner that may lead to deficiencies in certain skills due to a lack of patient contact. To alleviate this unbalance, the US Army has partnered with Oregon Health and Sciences University (OHSU) and Cooper University Health Care (Cooper U) under the Army Military-Civilian Trauma Team Training program to sustain their battlefield skills in high-volume trauma centers.

The Army Military Civilian Trauma Team Training program's stated goal is "to advance military trauma operational readiness for deployment around the globe by partnering with high-volume civilian trauma centers to gain critical teamwork and technical trauma skills". The goal of this assessment program is to evaluate a soldier's baseline trauma management competency and track their improvement throughout the duration of their Army Military Civilian Trauma Team Training participation. Servicemembers conduct two to three year rotations through the program in preparation for deployment to a forward medical unit or combat support hospital. By providing a method to assess and track a participant's trauma skills, this assessment program will provide a comprehensive and objective measure of benefit for the Army Military Civilian Trauma Team Training

Methods *(≥250 words)*

Data on injuries sustained in Operation Freedom's Sentinel and Operation Inherent Resolve between January 1st, 2016 and December 31st, 2019 was attained from the US military's Joint Trauma System (JTS). The most common causes of preventable combat deaths were incorporated more frequently in these scenarios and given more weight in the graded evaluations. The standards for these scenarios were established in accordance to recommendations by Advanced Trauma Life Support and the Military's Clinical Practice Guidelines (CPG).

The trauma scenarios were created based on casualties experiences during combat missions in Iraq and Afghanistan. The distribution of and frequency of injuries were altered according to the data reported by the Joint Trauma System. The majority of casualties will have undergone preliminary treatment in the field by a medic and the tested servicemember will receive a handoff via the standard MIST (mechanism, injuries, symptoms, and treatments) format and a casualty card. Occasionally a scenario will have incorrect information, missed injuries, or improperly applied interventions which simulates the chaos and rushed casualty management of combat.

These scenarios will be organized into clusters which each individually have comprehensive coverage of the most common causes of preventable combat death. This allows for a proctor to customize the scenarios that will be tested and reduce the likelihood of repeated cases or injury patterns. Clinical courses for casualties are dynamic and change in response to the provided treatments. The overall outcome for the casualty will reflect whether key interventions were performed and time threshold have been met. The key performance indicators and time thresholds will be used on a weight distributed scale to calculate the final score for a given trauma scenario.

Results *(≥500 words)*

Approximately 18-20% of combat deaths are preventable and hemorrhage, pneumothorax and hemothorax, and airway obstruction account for 99% of preventable combat deaths[1]. This series of scenarios will test heavily on the common pitfalls and sequela that lead to death in a hospital or aid station setting. Scenarios were created with an emphasis on extremity hemorrhage, pneumothorax and hemothorax from penetrating trauma, and airway obstruction from blood and teeth. Blast injuries from improvised explosive devices remains the most common mechanism of injury with gunshot wounds closely behind. Most preventable deaths from these mechanisms are arterial bleeding to an extremity and penetrating trauma causing tension pneumothorax or hemothorax[2]. Approximately 90% of combat-related deaths occur before the casualty reaches the hospital[3]. For the 10% that do survive, immediate identification of life threatening injuries and intervention is required to prevent or reduce decompensation[4].

The Army Military Civilian Trauma Team Training Assessment program includes a total of 17 trauma scenarios that are organized into 4 clusters according to mechanism of injury: gunshot wounds, blast injuries, blunt force trauma, and burns. According to JTS data from 1 Jan 2016 – 31 Dec 2019, there were a total of 598 casualties in Operation Freedom's Sentinel and Operation Inherent resolve (440 and 158, respectively). Injury types included 70% penetrating, 30% blunt, and 1% burns. Mechanism of injuries included 67% explosive devices, 30% gunshot wounds, 3% falls, 2% crush, and 1% motor vehicle collisions.

Due the importance of managing extremity hemorrhage, pneumothorax, and hemothorax these injuries appear in all four clusters and are tested extensively in the final scenario. Each cluster also highlights the characteristic wound of each mechanism. The additional 17th trauma scenario includes a catastrophic mass-casualty protocol designed to test the limits of the entire medial team. It involves multiple casualties with time sensitive and life threatening injuries that must be managed with no medic report or field treatments.

Each trauma team receives a brief handoff from the field medic designed to provide a synopsis of the casualty while providing inadequate information to solely treat the casualty. Contact with the medic is lost immediately after the report and a provided casualty card is the only available reference information. It will include the patient's allergies, injuries discovered in the field, mechanism of injury, vitals with timings, field interventions, and miscellaneous notes. Administered medications, vitals, and placement of interventions is always labeled correctly. Some injuries will not be annotated, some interventions will have failed or not been placed, and any undocumented medications were not administered.

Clinical courses begin with a primary survey which discerns the majority of life-threatening injuries and will be the foundation of each case. The first of three sets of vitals is given during the primary survey. After completion of the primary and appropriate interventions have been conducted, the course then enters the adjunctive phase and receives the second set of vitals. Depending on the appropriateness of care in the primary survey, the second set of vitals will reflect improvement or deterioration of the casualty's condition. Finally, the secondary survey is conducted. Non-life threatening injuries are discerned and treated. If any major interventions have yet to be completed, then the third set of vitals will reflect a decompensating casualty that is nearing death. If the scenario completes with any life threatening injuries untreated then the patient will have died and the scenario will be failed. Any failed scenarios should prompt a discussion of the underlying cause and highlight major areas of improvement and avenues to increase the survival of casualties with injuries at risk of preventable combat death.

Discussion *(≥500 words)*

The Army Military Civilian Trauma Team Training Assessment Program provides a trauma team focused, measurable metric that evaluates the tasks and skills that each member of the medical team should be proficient in, while also highlighting areas of improvement. In this way, the fundamental knowledge and trauma skills of soldiers in the Army Military Civilian Trauma Team Training program can be repeatedly evaluated without any familiarity to the cases that are presented. Soldiers will be tested on an initial cluster to establish their baseline proficiency and differing clusters will be presented at regular intervals to track their progress. It provides a comprehensive report of the medical team's performance, the benefits of training at civilian sites, and data that can be standardized and contrasted with other similarly built build programs in other medical systems.

Data gathered from this program can be contrasted with performance during deployments. Participation in Army Military Civilian Trauma Team Training is expected to create a tangible difference in casualty survival rates. This program is designed with a dynamic structure that may be revised in the future to accommodate a changing injury distribution or mechanism of injury. During Operation Inherent Resolve, a significant deviation from the military's CPG has been noted which results in suboptimal patient outcomes[5]. Completion of these scenarios will reinforce the current consensus standards and further decrease preventable deaths.

As the technology and arms of enemy combatants continues to progress and evolve so must our medical protocols and treatment algorithms. Analysis of specific casualty data during deployments may reveal weaknesses and areas of further improvement for the Army Military Civilian Trauma Team Training program. A participant scoring well but with unrealized actual improvement during deployment may reveal deficiencies in the Army Military Civilian Trauma Team Training Assessment Program or a change in battlefield tactics. Either situation occurrence should prompt a reevaluation of JST data and revision of assessment scenarios and scoring.

Scenarios are designed with a simulated mannequin or moulage patient in order to create the widest breadth of applicability possible. These scenarios may also be conducted with a live tissue casualty to achieve the most realistic and precise measurement of a participant's trauma management capabilities. Adaptation of these scenarios to a live tissue casualty would require precise guidelines for the wounding pattern, timing of wounding before participant interaction, and alteration of the dynamic clinical course. These adaptations would be especially advantageous for participants when deployment is imminent but are currently outside of the scope of the current Army Military Civilian Trauma Team Training Assessment project scope. Live tissue adaptation is one avenue of many possible methods of improvement.

Further work on this project will include refinement of the key performance indicator scoring system, live trials in simulation labs, inclusion of multiple casualty scenarios, and longitudinal tracking of Army Military Civilian Trauma Team Training participant's performance. Live trials should be conducted on established civilian physicians at the local program and military physicians in high trauma volume settings in order to establish a baseline proficiency value. Improvement of the Army Military Civilian Trauma Team Training Assessment program will require feedback and critique from servicemembers who complete a deployment after participation in this program. Their acquired insight of the benefits and deficiency will be crucial to creating an assessment tool that maintains relevancy to modern combat operations.

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Conclusions *(2-3 summary sentences)*

The Army Military Civilian Trauma Team Training program is designed to reduce the number of preventable combat deaths. The Army Military Civilian Trauma Team Training Assessment program will help facilitate this goal and identify key areas of improvement for medical service members as well as provide a comprehensive report on the benefits of the Army Military Civilian Trauma Team Training program.

References *(JAMA style format)*

1. Eastridge BJ, Mabry RL, Seguin P, et al. Death on the battlefield (2001-2011): implications for the future of combat casualty care [published correction appears in J Trauma Acute Care Surg. 2013 Feb;74(2):706. Kotwal, Russell S [corrected to Kotwal, Russ S]]. *J Trauma Acute Care Surg*. 2012;73(6 Suppl 5):S431-S437. doi:10.1097/TA.0b013e3182755dcc
2. Butler FK Jr, Holcomb JB, Shackelford S, et al. Advanced Resuscitative Care in Tactical Combat Casualty Care: TCCC Guidelines Change 18-01:14 October 2018. *J Spec Oper Med*. 2018;18(4):37-55.
3. Kotwal RS, Montgomery HR, Kotwal BM, et al. Eliminating Preventable Death on the Battlefield. Arch Surg. 2011;146(12):1350–1358. doi:10.1001/archsurg.2011.213
4. HENRY SHARONMD. *ATLS Advanced Trauma Life Support 10th Edition Student Course Manual, 10e*. AMERICAN COLLEGE OFSURGEO; 2018.
5. Plackett TP, Cherry DC, Delk G, et al. Clinical practice guideline adherence during Operation Inherent Resolve. J Trauma Acute Care Surg. 2017;83(1 Suppl 1):S66-S70. doi:10.1097/TA.0000000000001473