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TITLE: Virtual Reality Trauma Simulation: An Immersive Method to Enhance Medical Personnel Training and Readiness

PRINCIPAL INVESTIGATOR: CPT Kyle Couperus MD

CONTRACTING ORGANIZATION: Madigan Army Medical Center, Tacoma, WA

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CPT Kyle Couperus MD

E-Mail: kyle.s.couperus.mil@mail.mil

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14. ABSTRACT

Annual report covering reviewing progress on the Déjà vu project. This report covers work to date and reviews the current collaborators, participants, and overall accomplishments during year one. Virtual reality may offer a unique method to create training content that can operate without expensive facilities or instructors. This report describes a process to develop, pilot, and study training content that is specifically designed to replicate a real-world environment. It also reviews a series of trauma training outcome metrics, including gaze data metrics and methods.

Please be advised, there are some potentially disturbing images (computer generated images of traumatic injuries) within this report.

Disclaimer:
The views expressed are those of the author(s) and do not reflect the official policy of the Department of the Army, the Department of Defense, or the US Government.

15. SUBJECT TERMS
Virtual Reality, Emergency Medicine, Trauma Simulation.

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1. INTRODUCTION:

Military clinicians often arrive at deployment locations only having a few days to assume full medical treatment capabilities. British medical teams assuming control of in-theater ROLE III facilities have been trained in an identical medical environment prior to their arrival. U.S. medical teams attempt this practice, but simulated training environments frequently fail to accurately and realistically recreate the range and multitude of deployable settings/scenarios in which clinicians find themselves. Immersive virtual reality (IVR) may fill this gap by providing a high-fidelity, realistic experience that enhances task performance by creating a sense of presence and thoroughly engaging spatial memory. (1,2) Immersive virtual reality (IVR) can be highly effective as a medical simulation training platform. (3-6) Recent advancements have rendered this technology increasingly portable and visually realistic. While IVR technology appears to hold promise, there is a great deal to learn about the best methods to develop, implement, and share these training resources functionally. Several groups have created models that recreate current simulation lab environments with instructor input. While these systems increase training opportunities, decrease equipment needs, and offer broad potential, they still require a skilled trainer to 'prompt the system.' Removing this limitation increases scalability and accessibility while mitigating the training resource burden. We collaboratively reviewed/guided development of, to our knowledge, the only simulator that would offer immediate autonomous feedback to users through both real-time patient physiologic responses and overall grading. We hypothesize that training individuals in identical virtual environments with autonomous interactive trauma scenarios will allow more rapid assimilation to deployed treatment environments, shorten the time to life-saving interventions, decrease the risk of psychological trauma, and help maintain medical provider readiness.

The team that submitted for this project proposed evaluating various virtual medical treatment environments, developing metrics to assess trauma resuscitation performance, and evaluating the ability of virtual reality immersion to help providers prepare to treat a patient in a new treatment environment.

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5. Huber, T., Paschold, M., Hansen, C., Wunderling, T., Lang, H., & Kneist, W. (2017). New dimensions in surgical training: immersive virtual reality laparoscopic simulation exhilarates surgical staff. Surgical Endoscopy, 31(11), 4472–4477. https://doi.org/10.1007/s00464-017-5500-6
6. Grantcharov, T. P., Kristiansen, V. B., Bendix, J., Bardram, L., Rosenberg, J., & Funch-Jensen, P. (2004). Randomized clinical trial of virtual reality simulation for laparoscopic skills training. The British Journal of Surgery, 91(2), 146–150. https://doi.org/10.1002/bjs.4407

2. KEYWORDS:

- Virtual Reality
- Emergency Medicine
- Military Medicine
- Medical Simulation
- Trauma Simulation

3. ACCOMPLISHMENTS:

What were the major goals of the project?

Specific Aim 1 – Create immersive 3D virtual replicase of real role 1, role 2, and medical evacuation platforms.	Timeline	Date (if relevant)	% Complete
	Months		
Task 1: Create immersive 3D virtual replica of role 1 through contractor	1-10	1/15/2021	100%
Milestone # 1 Ensure role 1 3D virtual replica accuracy	10	1/20/2021	Complete
Task 2: Create immersive 3D replica of role 2 and 3 through contractor	1-12	1/20/2021	100%
Milestone # 2 Ensure role 2 and 3 3D virtual replica accuracy	12	1/30/2021	Complete
Task 3: Create immersive 3D replica of MEDEVAC platform through contractor	1-12		75%
Milestone # 3 Ensure medical evacuation 3D virtual replica accuracy	1-12		Ongoing
Specific Aim 2 – Augment current trauma simulator cases to expand treatment complexity continuing to reflect tactical combat casualty care and joint trauma system clinical practice guidelines			
Task 1: Ensure JTS CPG and TCCC guideline	1-16		85%

incorporation			
Milestone # 1 Complete review with internal team/nurses/medics/physicians	1-16		Ongoing
Task 2: Modular case builder through the contractor	4-16		50%
Milestone # 2 Implement case builder for scenario creation	4-16		Pending
Task 3: Modular equipment placement through the contractor	4-16		50%
Milestone # 3 Implement modular equipment placement	4-16		Ongoing
Task 4: Data Distribution System and Advanced Modular Manikin Integration through contract in coordination with the University of Washington	4-16		15%
Milestone # 4 Implement DDS	4-16		Ongoing
Task 5: Physiology engine integration through the contractor	4-16		25%
Milestone # 5 Complete integration of additional physiology engines	4-16		Ongoing
Specific Aim 3 – Incorporate multiplayer capability and mass casualty scenarios			
Task 1: Fully incorporate multiplayer capability and communication modules through the contractor	4-16		85%
Milestone # 1 feedback testing from the end-user group on the functionality of multiplayer	4-16		Ongoing
Task 2: Develop mass casualty scenarios leveraging physiology engine/case builder through the contractor	4-16		90%
Milestone # 2 feedback testing from the end-user group on the functionality of mass casualty scenarios.	4-16		Ongoing
Specific Aim 4 – Test individual subject and team performance in simulated trauma scenarios in the ‘real’ location replicated by the ‘virtual’			

environment. for evaluation standards.			
Specific Aim 4 – Test individual subject and team performance in simulated trauma scenarios in the 'real' location replicated by the 'virtual' environment. for evaluation standards.			
Task 1: Complete IRB Protocol	10-18		70%
Milestone # 1 MAMC IRB Approval/HRPO Approval	18		Pending
Task 2a: SAMMC IRB Review/concurrence	18-20		0%
Task 2b: HRPO approval for SAMMC	20-24		0%
Milestone # 2 SAMMC IRB protocol approval	24		Pending
Task 3: Madigan study implementation	18-30		0%
Milestone # 3 Madigan study completed enrollment	30		
Task 4: SAMMC study implementation	24-31		0%
Milestone # 4 SAMMC study completed enrollment	31		Pending
Task 5: Data analysis, publication, and presentation	31-36		5%

What was accomplished under these goals?

Throughout this description, references are made to identified outcome products from this project thus far, these are henceforth referred to as (P1,P2,P3,etc) in the descriptions below.

Aim 1) Create immersive 3D virtual replicas of real role 1, role 2, role 3, and medical evacuation platforms at MAMC. (in progress -90% completed)

- Task 1: Create an immersive 3D virtual replica of role 1 through the contractor
    - We selected a location that would be available for laboratory-style study/testing [Product-P5]

    - Selected an equipment set and layout the balanced realism with the need for visibility in VR and the end goal of evaluating the ability of VR to engage spatial memory and provide immersion benefits (helping remember where equipment is, etc).
    - The study team (Madigan) selected the final equipment. The development team leveraged 3D replicas of equipment, and placed in a modular fashion through the (virtual room) to match the real room (P5)
    - This environment is an identical replica (real-VR) for the primary study
    - Completed through a subcontract with Exonicus, Inc integrating this into a physiology engine driven simulation platform.
    - Some refinements may occur to the final equipment locations/style pending availability during the study protocol. We have leveraged local 3D printer capabilities to maximize item concordance where able [Product - P16].
- Task 2: Create immersive 3D replica of role 2 and 3 through contractor
    - We completed a 3D immersive virtual reality role 2 (P1)
        - The role 2 is based broadly on role 2 features as no fixed role 2 was available for scanning and sustainable testing.
    - We optimized the systems immersive/virtual reality role 3 created from a photogrammetry scan of Madigan's trauma bay.
    - Both of these tasks were completed by the subcontractor Exonicus, Inc. and concurrently integrated patients with dynamic physiology and automatic scalable feedback (P3) which was substantially updated for clarity and feedback usability in concordance with JTS CPGs, TCCC Guidelines, and ATLS guidelines.
- Task 3: Create immersive 3D replica of MEDEVAC platform through contractor
    - We have tested a beta medevac helo platform (P14)
    - We are pending the arrival of our Leo 3D Scanner to create a 3D replica of a field ambulance. The Leo scanner was ordered in (September 2020) but has been delayed due to disruptions in the scanner's parts supply chain (secondary to COVID-19). Arrival is slated for next week. We will beta test different medevac solutions to select the best to incorporate.
    - Our goal was to have this task (complete) by the end of year one. We consider this to be 75% complete based on the above, but will continue to work on this once the Leo scanner arrives to finalize.

Aim 2) Augment current trauma simulator cases to expand treatment complexity continuing to reflect tactical combat casualty care and joint trauma system clinical practice guidelines at MAMC. (in progress -90% completed)

- Task 1: Ensure JTS CPG and TCCC guideline incorporation
    - While we initially listed this as a task for months 1-16, it should have been reflected as 1-36. We have continuously updated/revised content and grading to keep current with JTS CPGs and TCCC Guidelines. We will continue to do so for the entirety of the project.
    - We have completed multiple iterations and sent demonstration grading videos to collaborators, with testing demonstrations/feedback provided by CPT Kyle Couperus, CPT Alex Koo, and Dr. Chad Gorbatkin to ensure grading/feedback fidelity/accuracy.

    - Curriculum planning completed leveraging Kern's model to create learning goals/planning based on the MARCH algorithm with a composite 360 video and CGI-based training lectures.
    - The PI and AI developed lectures for the TCCC airways (Script - P17), breathing, and hemorrhage. Tested out the 360 video camera and determined the software to edit/create 360 lessons for the intervention plan.
- Task 2: Modular case builder through contractor
    - To enhance trainers ability to iterate multiple different cases, a scenario/case builder is required. This is being completed by subcontractor Exonicus, Inc. They have completed multiple subject matter expert interviews (10) and led several iterative meetings to design a system that will meet the educational goals of the project. A wireframe has been completed with a customizable pathology timeline/injury condition. Integrating a process to see the vital signs during the proposed scenario timeline. (P4).
    - Additional injury visualizations have been created to incorporate into a scenario author/editor (P8)
    - Improvement patient movements for GSC/Motor evaluation are being integrated (P10)
    - Coding is 20% complete to achieve the goals/backing of this wireframe design.
- Task 3: Modular equipment placement through contractor
    - The subcontractor Exonicus, Inc has implemented a system to place equipment for our required environments in a modular fashion. In addition, they are integrating an equipment management system within the scenario builder to achieve this task.
- Task 4: Data Distribution System and Advanced Modular Manikin Integration
    - (Five) collaborative meetings have been planned, and a staging plan presented by UW and Exonicus Inc. to implement DDS/AMM standards into the training system. Exonicus has a 1 FTE engineer focused on this integration process. Additionally we have iterative meetings weekly to guide the process.
    - (Four) collaborative meetings have occurred with ARA/BioGears (Austin Baird) and Exonicus to integrate biogears for Burn and Sepsis cases.

AIM 3) Incorporate multiplayer capability and mass casualty scenarios. (in progress - 85% complete)

- Fully incorporate multiplayer capability and communication modules through the contractor.
    - Developed by Exonicus, Inc and incorporated into the training platform. The collaborative team successfully tested the first Mass Casualty Triage Role 2 Multiplayer (February 2021) [P2] with 6 individuals from two continents.
    - Further updates are in progress to maximize integration of skills/tasks, and to maximize communication/avatar naming to optimize the multiplayer training experience.

- Developing mass casualty scenarios leveraging physiology engine/case builder through the contractor

- An overarching scenario/injury pattern/timeline was developed collaboratively with the subcontractor Exonicus, Inc (P1) who implemented a 5 patient mass casualty event in virtual reality.
- Specific patient-level feedback/grading sheets have been completed leveraging trauma resuscitation task analysis.
- Grading/feedback updated systems were implemented by the subcontractor for a more simplified/understandable review. [Product-P3]. This allows feedback on the individual patients and the overall scenario.
- During this process new 3D objects were created/implemented by the subcontractor (stretcher, ambu bag, ventilator, and several more)
- During this process, a documentation/charting system was integrated (TCCC casualty card/DD Form 1380) by the subcontractor. This card is used to capture what injuries the learner identifies [P11]
- The Exonicus development team created an advanced Mass Casualty Triage role 2 level that incorporates a power outage/blackout with Gunfire/helicopter/explosion sounds to mimic the actual situations. The players wear a headlamp in the VR, mimicking wearing a headlamp in simulation. [Product P12]. This has not been refined to the point of battery limitations on ventilators/pumps, but could be in the future.
- The subcontractor Exonicus, Inc updated new graphic injuries, interaction steps with color-coded injury points on the patients. This will help to connect with Biogears and Case builder easier. [Product-P9]
- The Exoncius, Inc development team is working on the wireless version which will likely leverage an Android version (or) through steam with a virtual desktop streaming application. The following report will follow up with new updates on the wireless trauma simulator version.
- The Exonicus, Inc team also improved the patient 3D animation movement, and injury visualization (Product P6 and P10)

AIM 4) Test individual subject and team performance in simulated trauma scenarios in the ‘real’ location replicated by the ‘virtual environment, for evaluation standards at MAMC and SAMMC. (in progress)

- Task 1: Complete IRB Protocol
  - Research support contract executed. In January a Research Assistant (Oanh Tran) was on board and started drafting the eIBR protocol. There was almost a 10 month delay from funding arrival until hire due to delays in contracting. Our proposed completion/approval date for the IRB was by month 18. This is still achievable.
  - The research team determined proposed control group (video lectures and deployed medicine) and intervention groups VR training plan [Product - P7]
  - The Madigan Investigator team completed an outcome metric assessment
    - The Trauma Training Score (being developed under concurrent trauma training efforts) has been created (P15) and is on pending IRB approval for a final evaluation and validation via a modified delphi review. Pending approval this will be the primary outcome metric for the proposed study.
    - The research team determined the Eyetracking data metrics using Tobii glasses and hypothesized that participants with virtual reality exposure would

have decreased overall dwell time (shelf), increased time to first fixation (shelf), increased first fixation duration (shelf), decreased visit count (shelf), decreased average visit duration (shelf), increased average fixation durations (in all AOIs and overall), and decreased saccade count (in all AOIs and overall). The first test was run with the research team members and produced some graphs on these desired metrics. The document is attached to this annual report submission. [Supplement attachment - S1]

    - HPRO approval from the sponsor organization will be obtained (after IRB approval) and before (beginning) any data collection
- Task 2a: SAMMC IRB Review/concurrence
    - Pending completion of task 1
- Task 3: Madigan study implementation
    - Pending above tasks
- Task 4: SAMMC study implementation
    - Pending above tasks
- Task 5: Data analysis, publication, and presentation
    - We are submitting two methods/development abstracts under this effort to MHSRS. These are currently in draft form and are attached as supplements [[S2] MHSRS 2021 Mass Casualty Incident (MCI) Abstract and S3-MHSRS 2021 Deja Vu Abstract]

What opportunities for training and professional development has the project provided?
If the project was not intended to provide training and professional development opportunities or there is nothing significant to report during this reporting period, state "Nothing to Report."

Describe opportunities for training and professional development provided to anyone who worked on the project or anyone who was involved in the activities supported by the project. "Training" activities are those in which individuals with advanced professional skills and experience assist others in attaining greater proficiency. Training activities may include, for example, courses or one-on-one work with a mentor. "Professional development" activities result in increased knowledge or skill in one's area of expertise and may include workshops, conferences, seminars, study groups, and individual study. Include participation in conferences, workshops, and seminars not listed under major activities.

- Dr. Couperus and Two Research Assistants (Drew Thomas and Stacie Barczak) attended the Madigan Applied Research Day Course in August 2020 under this effort.
- Dr. Couperus, Drew Thomas, Stacie Barczak, and Oanh Tran completed the Tobii Pro training event regarding how to leverage eye tracking data as a research outcome metric.

How were the results disseminated to communities of interest?

- To date (1 year into this effort), no specific publications have been completed. We are submitting two MHSRS abstracts (MCI and DÉJÀ VU) attached to this submission (S2 & S3). Additionally, we have had correspondences with the University of Washington (David Hananel, Ph.D.), the University of Vanderbilt (Dr. Ryan Walsh), Applied Research Associates (ARA, Austin Baird), among other collaborators in this field regarding the developments in this project.

What do you plan to do during the next reporting period to accomplish the goals?

The following report will complete the scan and replicate additional medivac platforms in VR and ensure its 3D virtual replica accuracy. The TCCC lectures (Airway, Breathing, Hemorrhage) will be recorded and edited in 360 and PC/2D platforms. The eIRB protocol is currently drafting and will aim to be finished by the following report. The research team will continue working with the contractors to finalize curriculum integration, validate trauma simulator environments/cases, and DDS/AMM integration.

4. **IMPACT:**

What was the impact on the development of the principal discipline(s) of the project?

This project supports the development of a training system that we hypothesize will improve medical training readiness and improve the care provided to individuals injured through traumatic mechanisms (military and civilian). Extensive progress has been made on the mass casualty scenario (P1) and the scenario/modular building platform(P4), and the selection and creation of a treatment location replica (P5). While this has not directly resulted in change to-date, the project team is preparing the study and IRB process to evaluate this system. The protocol design has been finalized and is pending final editing and submission. Additionally, we have integrated an eye-tracking solution as a study outcome. We propose this will helpfully evaluate whether virtual reality is able to 'prepare' a medical provider for a treatment location they have never seen in real life. The finding from this study could have significant impacts on training processes in civilian and military settings crossing multiple disciplines.

What was the impact on other disciplines?

As related to the ability of virtual reality to 'prepare' an individual for performing life-saving tasks in that same real-world location, the findings from this project may impact training processes in the civilian and DoD sectors. Currently, our modular building system/grading system/processes have been communicated with.

What was the impact on technology transfer?

The overall scenario/case design process we have leveraged to communicate with the subcontractor (Exonicus, Inc) was communicated with David Hananel (AMM/UW) and Austin Baird (ARA) during their concurrent efforts to create industry standards and similar scenario editing tools.

Experience from this was transferred as legally able to the TRIAGE project to optimize a similar (yet quite different based on AIMs) mixed reality training system. Multiple

meetings were attended, and feedback was provided regarding grading systems/processes based on lessons learned in this project.

Exonicus, Inc has expressed interest in continuing to develop these technologies beyond the study effort.

The results of this project (to-date) have been provided to the 5G Medical Steering Committee and multiple other DoD individuals to showcase capabilities/processes and to engage feedback for system optimization.

What was the impact on society beyond science and technology?

Two concurrent protocols are being developed (University of Washington, Anesthesia) and (Virginia Commonwealth University, Emergency Medicine) to leverage/evaluate the ability of this platform to help train within their respective specialties.

5. CHANGES/PROBLEMS:

Delay in scanning final medical evacuation platform (risk mitigation with piloting helo platforms). This was secondary due to a 6 month COVID related delay. It will not impact the overall project.

Delay in hiring research assistant/protocol drafting. While our time window is shorter than desirable, we do not foresee any delays secondary to this delay.

Changes in approach and reasons for change

No significant changes have occurred to date.

Actual or anticipated problems or delays and actions or plans to resolve them

Nothing to report

Changes that had a significant impact on expenditures

Nothing to report

Significant changes in use or care of human subjects, vertebrate animals, biohazards, and/or select agents

Significant changes in use or care of human subjects

Nothing to report

Significant changes in use or care of vertebrate animals

Nothing to report

Significant changes in use of biohazards and/or select agents

Nothing to report

6. PRODUCTS:

- **Publications, conference papers, and presentations**

Journal publications.

Nothing to report

Books or other non-periodical, one-time publications.

Nothing to report

Other publications, conference papers and presentations.

Abstracts submitted to 2021 Military Health System Research Symposium (MHSRS):

1. Couperus et. al "Mass Casualty Incident (MCI) Management In VR: Development and Usability of an Instructorless MCI Training Scenario In Virtual Reality"
2. Couperus et. al "Déjà vu: Virtual Reality In Situ Training in an Unfamiliar Environment and Trauma Resuscitation Performance"

- **Website(s) or other Internet site(s)**

Nothing to report

- **Technologies or techniques**

Nothing to report

- **Inventions, patent applications, and/or licenses**

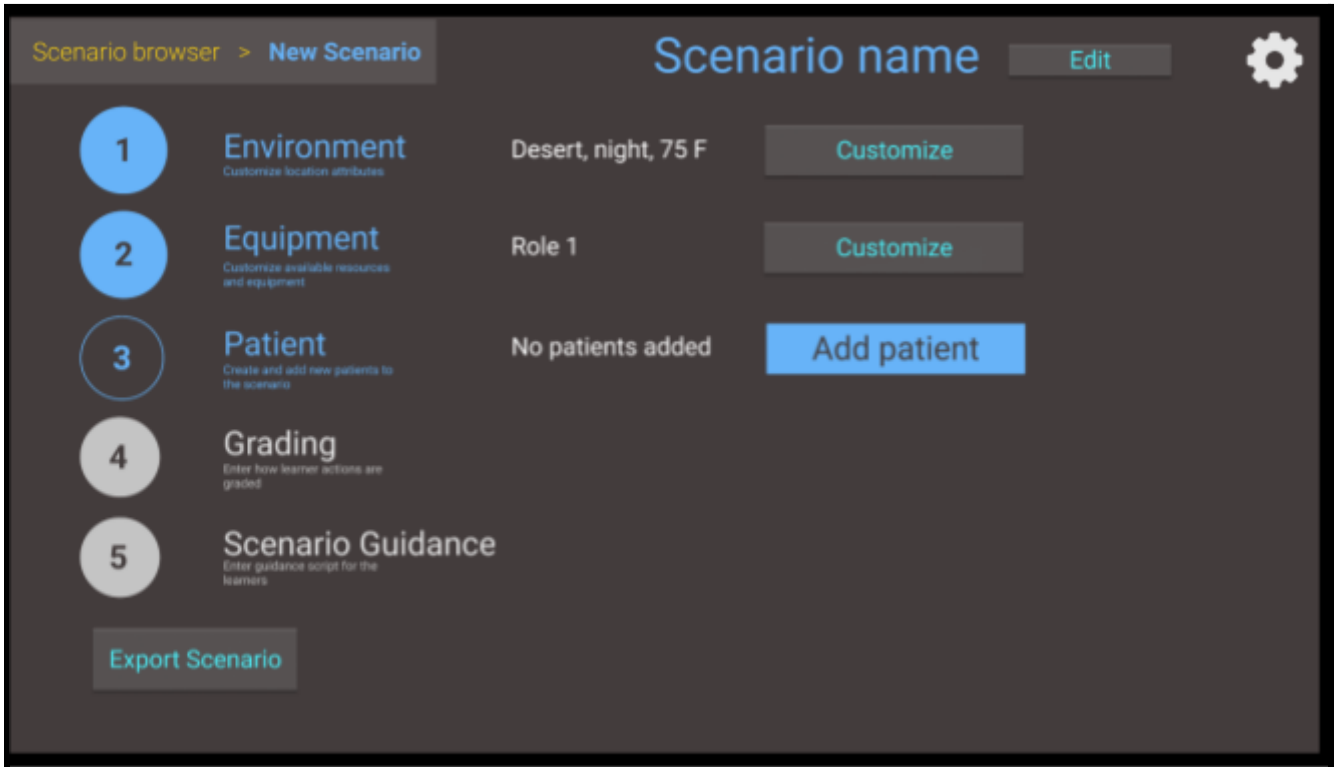
Nothing to report

- **Other Products**

[P1] Virtual reality, physiology drive, auto-feedback(no instructor needed), mass casualty training event -additional information is in supplement attachment [S5]

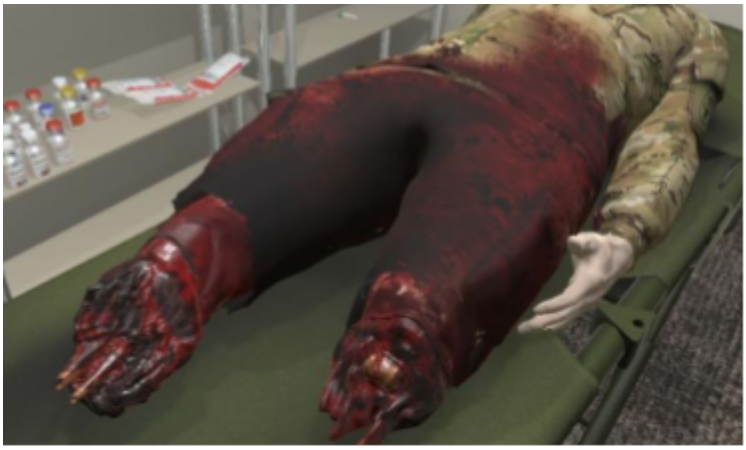
[P2] Mass casualty training event multiplayer integration

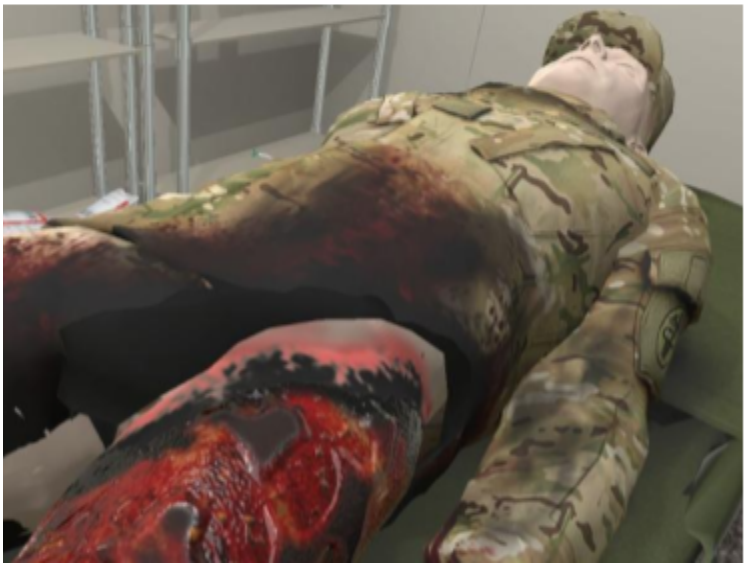
[P3] Grading refinement based on a 5 patient mass casualty event. Grading tracks 130 actions, and prioritizes critical actions based on the MARCH and ATLS ABCDE algorithms. It provides (as shown) a pass/fail output based on pre-set thresholds.



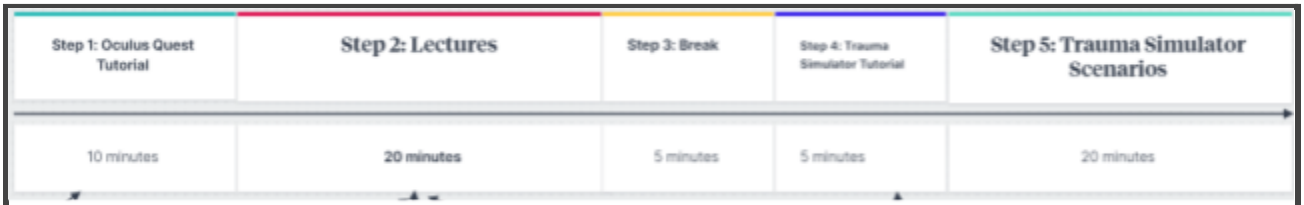
[P4] Scenario(Case) builder that allows modular equipment placement, individual patient creation, patient level grading, and overall scenario text/timeline inputs.

[P5] Role 2 VR room - Replicating a real-world location that can be tested in a laboratory type protocol to assess for immersion training benefit. This room was chosen not for deployed realism, but for accessibility to allow pre-post testing maintaining an equipment setup over several months with identical dimensions and equipment locations. Other more realistic environments (Role 1+ were also completed).

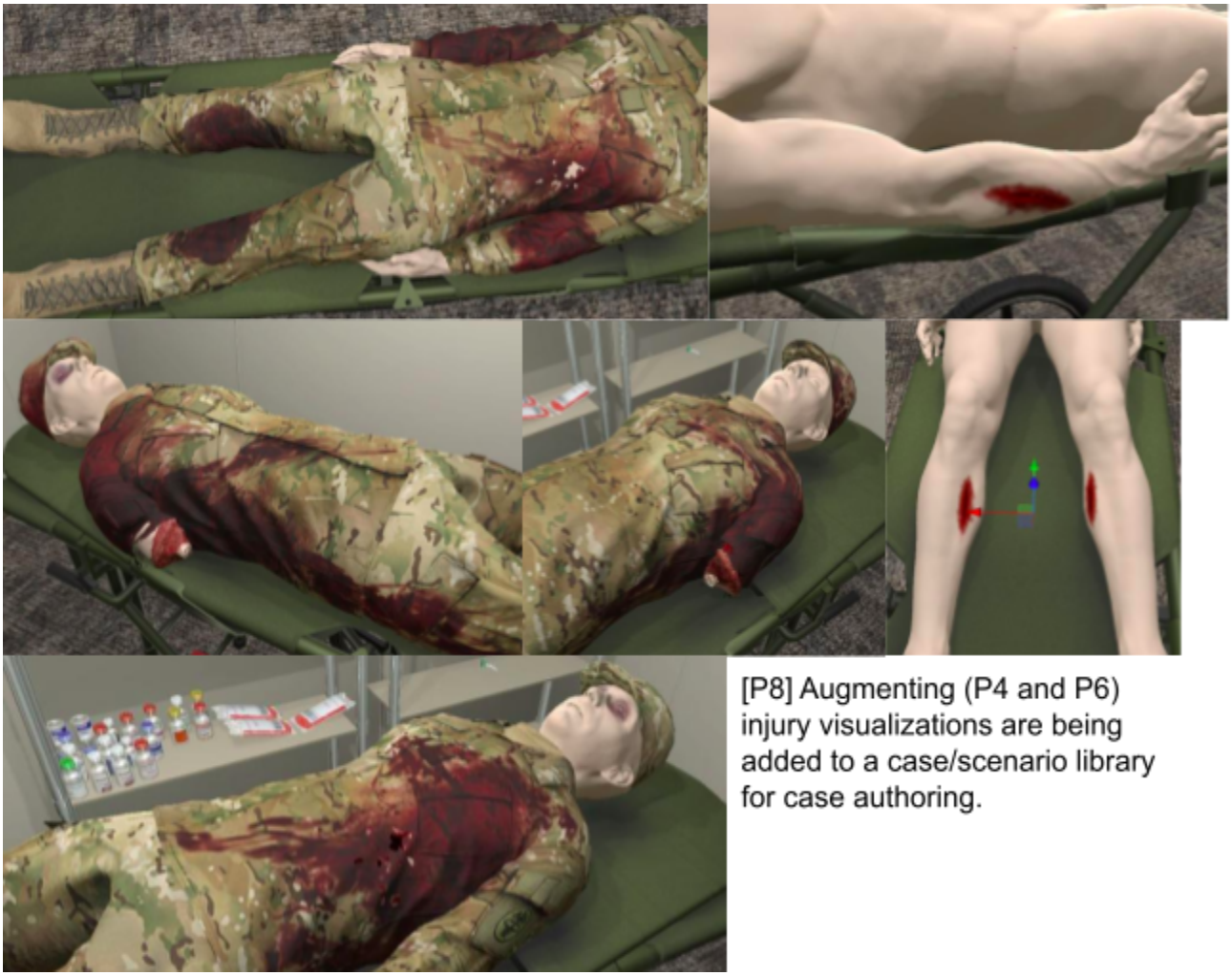




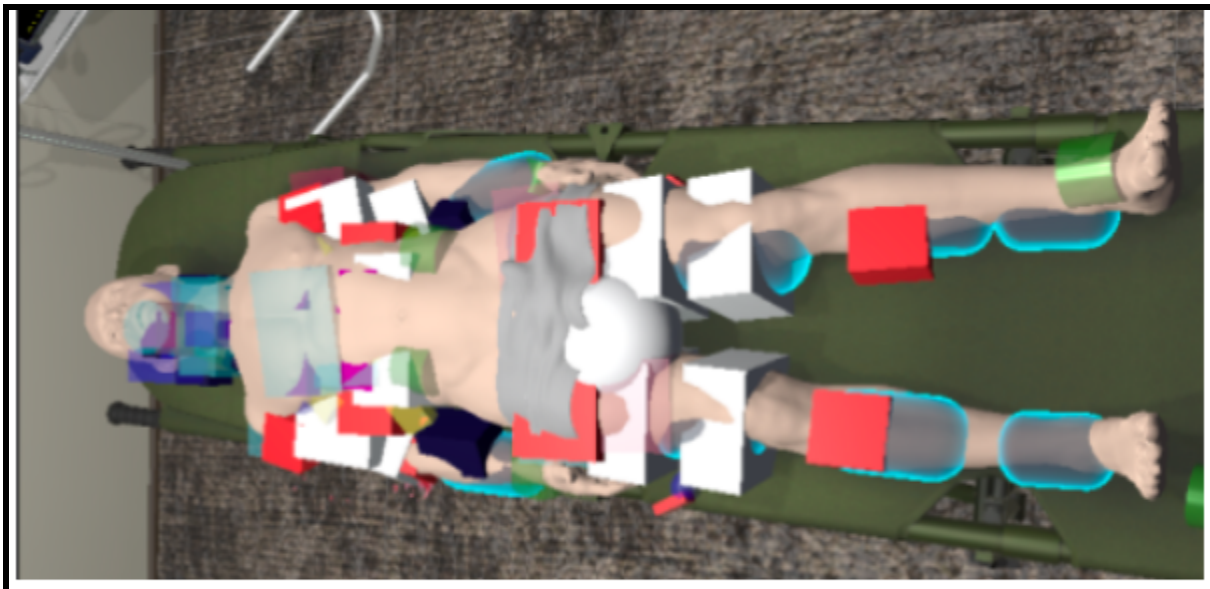
[P6] Injury visualizations edited for improved training realism.



[P7] Deja Vu training plan for a learning outcomes study based on brief immersion training.

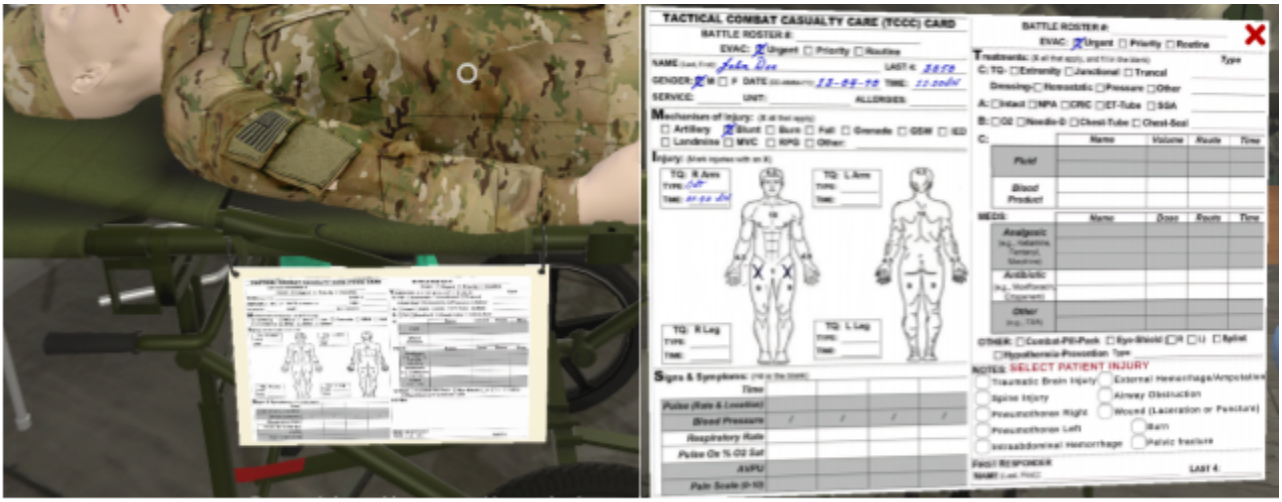


[P8] Augmenting (P4 and P6) injury visualizations are being added to a case/scenario library for case authoring.



[P9] Patient zones for various patient assessments and treatment interventions.

[P10] 3D improved animation patient movement for assessment of motor function
https://drive.google.com/file/d/1aqFcAcWWf87s2FFVS3tTSSLpoydITUrK/view?usp=sharing



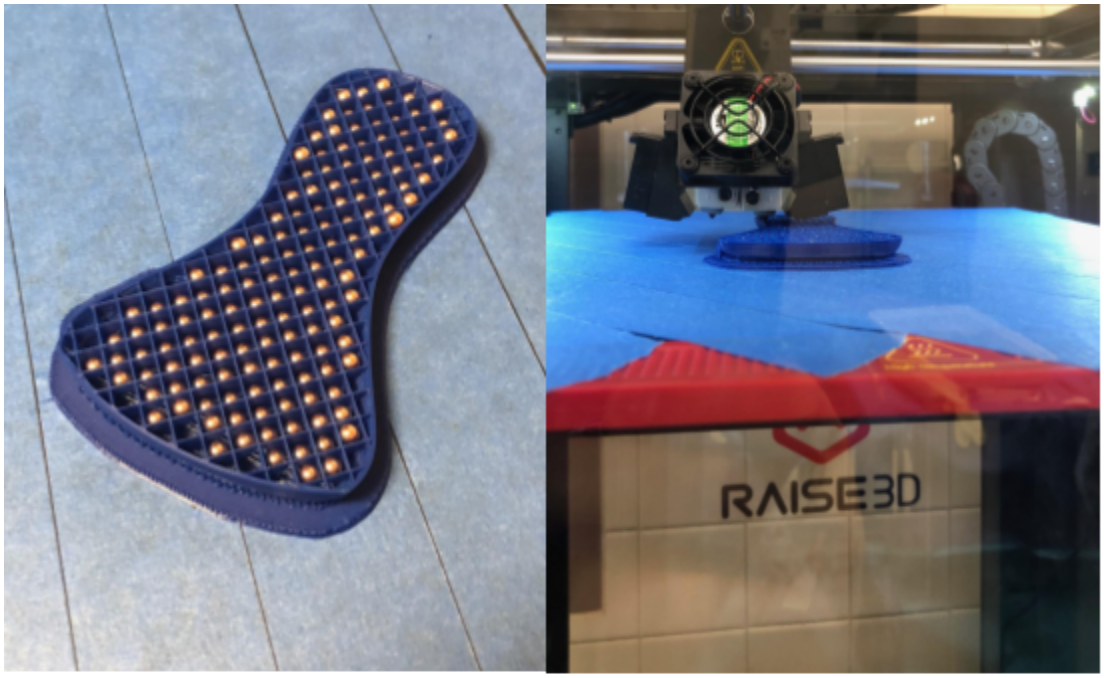
[P11] Developed an interactive TCCC card for documentation capabilities within virtual reality

[P12] Advanced level of Mass Casualty Triage Role 1(+) during the power outage - videos can be provided to the sponsor if that would be beneficial

[P13] Tobii eye-tracking data assessment. We completed pilot testing for a refined eye-tracking outcome measure to assess the effect of virtual reality training in a virtual replica of a real world location. Specifically, pending IRB/HRPO approval we will evaluate if individuals gaze attention varies based on training group, specific to different areas of interest (patient, monitor, equipment) Please see the supplement attachment [S1]

[P14] Tested potential medevac platforms in virtual reality

P[15] Trauma Training Score (Trauma Training Outcome Metrics) - Please see supplement attachment [S4]



[P16] 3D printer in process of making 3D ultrasound probe

[P17] TCCC airway lecture script - Please see supplement attachment [S6]

7. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS

What individuals have worked on the project?

Name: Kyle Couperus, BSN, MD
Project Role: Principal Investigator
Researcher Identifier: N/A
Nearest person month worked this quarter: 0.75 (18% effort x 4 months)
Contribution to Project: Dr. Couperus continues to oversee the project's progress, development plan, contracting, IRB development, curriculum development, and overall coordination. His time contribution has been somewhat higher than initially proposed secondary to fulfilling a research coordinator contract

Name: Scott Young, DO
Project Role: Assistant Investigator
Researcher Identifier: N/A
Nearest person month worked this quarter: 0.19 (5% effort x 4 months)
Contribution to Project: Dr. Young has taken lead in developing our primary outcome metric measurement tool (Trauma Team Score) based on prior CDMRP funded efforts (Dr. Holcomb) almost 2 decades ago.

Name: Alex Koo, MD
Project Role: Assistant Investigator
Researcher Identifier: N/A
Nearest person month worked this quarter: 0.19 (5% effort x 4 months)
Contribution to Project: Dr. Koo has assisted with site selection and overall curriculum development. He is leading curriculum development for circulation and hemorrhage.

Name: Zachary Sletten, MD
Project Role: Assistant Investigator
Researcher Identifier: N/A
Nearest person month worked this quarter: 0.10 (2.5% effort x 4 months)
Contribution to Project: Dr. Sletten has assisted with standardized testing simulation case development (for pre-post testing scenarios).

Name: Chad Gorbatkin, MD
Project Role: Assistant Investigator
Researcher Identifier: N/A
Nearest person month worked this quarter: 0.10 (2.5% effort x 4 months)
Contribution to Project: Dr. Gorbatkin has assisted with overall curriculum design planning, planned study design, and site selection.

Name: Stacie Barczak
Project Role: Research Coordinator
Researcher Identifier: N/A
Nearest person month worked this quarter: 0.75
Contribution to project: Protocol drafting, eIRB entry/query resolution, scheduling, and other administrative tasks, and participation in weekly sync calls for project tracking and planning.

Name: Oanh Tran

Project Role: Research Assistant II
Researcher Identifier: N/A
Nearest person month worked this quarter: 1.00
Contribution to project: Protocol drafting, room staging and scanning, eIRB entry/query resolution, scheduling, and other administrative tasks, and participation in weekly sync calls for project tracking and planning.

Has there been a change in the active other support of the PD/PI(s) or senior/key personnel since the last reporting period?

Nothing to report

What other organizations were involved as partners?

Organization Name	The Geneva Foundation
Location of Organization	917 Pacific Ave Suite 600, Tacoma, WA 98402.
Contribution to the Project	Financial support. The Geneva Foundation provided Research Assistant II contract services.

Organization Name	Exonicus
Location of Organization	CoMotion Labs - University of Washington Fluke Hall 215 4000 Mason Rd Seattle, WA 98105
Contribution to the Project	Financial support and in-kind support. The Exonicus engineer team worked with the research team to develop VR environments that replicate the real-world setting.

Organization Name	University of Washington
Location of Organization	1959 NE Pacific Street | Box 356410 | Seattle, WA 98195-6410
Contribution to the Project	Collaboration support. The University of Washington, Center for Research in Education and Simulation Technologies (UWCREST) work with the ARA and the MAMC research team on DDS/AMM integration

Organization Name	Applied Research Associates, Inc
Location of Organization	4300 San Mateo Blvd. NE, Suite A-220 Albuquerque, NM 87110
Contribution to the Project	Collaboration. ARA and UWCREST work with the MAMC research team on DDS/AMM integration.

Organization Name	Kitware, Inc
Location of Organization	1712 Route 9 Suite 300 Clifton Park, New York

	12065 USA
Contribution to the Project	Collaboration support. The Kitware staff have provided guidance on physiology engine integration processes/code/systems. We appreciate their insights and involvement.

8. SPECIAL REPORTING REQUIREMENTS

COLLABORATIVE AWARDS: .

QUAD CHARTS:

9. APPENDICES:

Supplements information:
● [S1] Tobii Eye Tracking - eBRAP Annual Report Supplement ● [S2] MHSRS 2021 Mass Casualty Incident (MCI) Abstract - eBRAP Annual Report Supplement ● [S3] MHSRS 2021 Deja Vu Abstract - eBRAP Annual Report Supplement ● [S4] Training Trauma Scoring Sheet v6 ● [S5] Mass Casualty Scenario Simulation Board.pdf ● [S6] TCCC airway lecture