AWARD NUMBER: W81XWH-22-1-0610

TITLE: **Rapid Assessment for Prehospital Triage of Evacuation and Medical Resources En Route Care Award (RAPTER ERCA)**

PRINCIPAL INVESTIGATOR: Francis X. Guyette, MD

CONTRACTING ORGANIZATION: University of Pittsburgh

REPORT DATE: October 2023

TYPE OF REPORT: Annual

PREPARED FOR: U.S. Army Medical Research and Development Command
Fort Detrick, Maryland 21702-5012

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
OCTOBER 2023	ANNUAL	1SEPT2022 - 31AUG2023

4. TITLE AND SUBTITLE

Rapid Assessment for Prehospital Triage of Evacuation and Medical Resources En Route Care Award (RAPTER ERCA)

5a. CONTRACT NUMBER
W81XWH-22-1-0610

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Guyette, Francis X, MD — Brown, Joshua, B, MD

Email: guyefx@upmc.edu — brownjb@upmc.edu

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

UNIVERSITY OF PITTSBURGH
JENNIFER E WOODWARD
OFFICE OF SPONSORED PROJECTS
300 MURDOCH 1 BUILDING
3420 FORBES AVENUE
PITTSBURGH PA 15260-3203

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

U.S. Army Medical Research and Development Command
Fort Detrick, Maryland 21702-5012

10. SPONSOR/MONITOR'S ACRONYM(S)

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

12. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

Our overall objective is to help both the military and civilian prehospital clinicians identify patients in the field that benefit from early evacuation and facilitate rapid triage, treatment, and allocation of resources. We will develop a clinical decision tool (CDT) to identify patients benefiting from early tactical evacuation using physiologic waveform data and anatomic injury patterns that predict the need for life-saving interventions (LSI), as well as validate patterns of physiologic data to predict early LSI using low size, weight, and power wearable sensor technology. In the first quarter reporting period we completed University of Pittsburgh IRB regulatory approvals, our initial retrospective phase HPRO approval. We made substantial progress in data processing and cleaning by identifying the retrospective phase patient cohort, cleaning, and processing the waveform data, and linking this to outcomes and in-hospital procedure data for the largest participating center.

In the second quarter, we completed HRPO approval for the prospective phase of the study and established agreements with NOMA AI to proceed with model development. We completed linking to all the remaining trauma centers in the study cohort and identified the patients meeting inclusion and no exclusion criteria. These data were cleaned, and the electronic signals processed. We delivered the test data and the first tranche of data for model building to NOMA.

15. SUBJECT TERMS

NONE LISTED

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			USAMRDC
U	U	U	UU	28	19b. TELEPHONE NUMBER *(include area code)*

TABLE OF CONTENTS

1. INTRODUCTION:

Our overall objective is to help both the military and civilian prehospital clinicians identify patients in the field that benefit from early evacuation and facilitate rapid triage, treatment, and allocation of resources. We will validate patterns of physiologic data shown to predict early LSI through a prior project (RAPTER CDT development STUDY22030137) using low size, weight, and power wearable sensor technology through a minimal risk prospective cohort study. The monitor is a small sticker that emits and measures light and can measure the body's electrical activity. As such, it can measure continuous physiological data in patients including brain electrical activity (electroencephalography [EEG]), heart rhythm and rate, oxygen saturation, and respiratory rates. We will prospectively enroll 500 trauma patients transported by Stat MedEvac critical care transport. Subjects will be identified and enrolled by STAT MedEvac flight nurses and paramedics upon their arrival to the scene of patients with traumatic injuries. The sensor device will be applied externally to the forehead of patients in addition to other standard monitoring equipment, and the device will record physiologic data. Upon arrival to the ED, study personnel will meet the patient, remove the device, and collect recorded data. Clinical data will be obtained from the patient's electronic medical record to assess the ability of physiologic data captured by the sensors to predict the need for life-saving interventions after injury.

2. KEYWORDS:

Military, Life Saving Intervention, Flight, Monitoring, Physiologic, Data, STAT MedEvac, Trauma, Critical Care Transport, Electroencephalography, Prehospital, Clinician, Rapid Triage, Patient.

3. ACCOMPLISHMENTS:

What were the major goals of the project?

Subtask 1.1 Obtain IRB and HRPO approval – 100% complete

- Pitt IRB#1 STUDY22030137-Rapid Assessment for Prehospital Triage of Evacuation and medical Resources (RAPTER) Clinical Decision Tool Development-Initial Approval on 06/22/2022
- Pitt IRB #2 STUDY22030141-Rapid Assessment for Prehospital Triage of Evacuation and medical Resources (RAPTER) wearable sensor validation – Approved 08/31/2022; Pitt IRB Annual renewal received on 6/2/23
- HRPO - OHRO Approval Memorandum (E03298.2a (Pitt), E03298.2b (NOMA-AI) and E03298.2c(Lifeware Labs) - OHRO Approval Memorandum (Proposal Number DM210241, Award Number W81XWH-22-1-0610) dated 17 March 2023

Subtask 1.2 Identify patients meeting inclusion/exclusion criteria in retrospective data registries 100% complete (month 6)

- Inclusion & Exclusion retrospective prehospital data is 100 % complete and on schedule

Subtask 1.3 Obtain, preprocess, and clean physiologic waveform data from repository – 100 % complete (month 9)

- 100% of waveform includable repository data is complete, preprocessed and cleaned to modeling specification on schedule

Subtask 1.4 Obtain and link patient level physiologic waveforms, prehospital and in-hospital study variables and outcome data –100% complete (month 6)

- Patient level physiologic waveforms, prehospital and hospital study variables and outcome data is on schedule. However, granular hospital level linkage is awaited on a subset of the target cohort.

Subtask 1.5 Determine and link life-saving interventions at the level of the patient. –100% complete (month 6)

- Patient lifesaving interventions linked and complete. However, based on iteration and algorithm tuning we may identify additional LSI that need to be coded.

Additional Accomplishments:

- Dr. Guyette provided a RAPTER informational brief on 8 June 2023 to CAPT Travis Polk and senior leaders of the Combat Casualty Care Research Program (CCCRP) as part of a larger portfolio overview meeting at Fort Detrick, MD on current DoD funded pre-hospital research programs.
- Ron Poropatich, MD serves as a military medical liaison to DoD organizations (CCCRP, USAMMDA, DHA, USAISR, etc.)
- Purchase of Lifeware equipment essential to the study
- Purchase of hardware and software to assist our team in meeting study milestones

Subtask 2.2 Training machine learning algorithms to predict life-saving interventions

What was accomplished under these goals?

1. University of Pittsburgh IRB approval obtained for retrospective (6-22-22) and prospective (08-31-22) phases of the project. HPRO approved the retrospective phase (09-22-22) of the project and approved the prospective phase (3-17-23).
2. University of Pittsburgh Retrospective/Wearable IRB Annual Renewal approved on 06-02-23.
3. Prehospital patients for the retrospective phase (phase 1) were identified and waveform data were cleaned and readied for transfer to NOMA AI for machine learning approaches.
4. In-hospital outcomes and life-saving interventions were identified and linked to patients at all participating UPMC trauma center sites (UPMC Presbyterian, UPMC Mercy, UPMC Altoona, UPMC Hamot).
5. DUA between University of Pittsburgh and NOMA AI for data transfer was approved on 01-11-23.
6. Completed 45 weekly RAPTER lab meetings to discuss aims, timelines, & progress.
7. NOMA AI kickoff meeting completed on 04-13-23.
8. NOMA AI ran test data to confirm transfer and formatting prior to modeling
9. A secure two-way SFTP channel was created between NOMA AI and the University of Pittsburgh team to facilitate efficient ongoing collaboration and data sharing.

10. NOMA AI conducted rigorous data validation to ensure the transferred data's accuracy and quality. Minor issues were identified, which were in turn resolved by the University of Pittsburgh team.
11. Data was ported into the NOMA AI data warehouse to facilitate the scalable execution of processing pipelines and experiments.
12. Preliminary multimodal machine learning models were developed:
    a. Waveform data was preprocessed with standard techniques such as a bandpass filter to clean before input to machine learning models.
    b. Multiple patient sampling methods were adopted to create training data from the patient's raw clinical data.
    c. Feature learning was developed that adopted multiple levels of feature generation techniques, including window-based time-domain features from the waveform signals (ECG and PPG) and statistical summarization techniques to create patient feature representations that machine learning models could consume. The final methods resulted in a 5,152-dimensional feature vector representation for each patient sample.
    d. Multiple sampling strategies were evaluated. Finally, the team decided that the more realistic model evaluation is to evaluate models regularly throughout the entire patient episode with regular samples generated every 2 minutes. A sample constituted a positive sample if an LSI intervention existed after the time of the sample. This design is also in line with dynamic application of models as well.
    e. Finally, machine learning models were trained that used the trained feature representations to predict future life-saving interventions. Current models use multimodal input, including waveform data (ECG and PPG), physiological measurements, vital signs, and demographics to predict LSI outcomes.
    f. A 30% hold-out data (train and test split) strategy was used for training and evaluating models.
    g. The following table shows the performance of the preliminary research. The multimodal models outperform the proposed performance (AUROC > 0.8). In addition, the effectiveness of various data modalities was evaluated by training separate machine learning models that only relied on a subset of the data modalities. While the waveform-only machine learning model slightly under-performed the multimodal models, it still performed relatively well. We believe an ideal solution for the military application would include signal data to maximize usability. This motivates further focused research into better methods and improved approaches for learning from signal data. Therefore, we have identified multiple directions for learning better models from signal only modalities which we plan to pursue.

Model	AUROC	AUPRC
All Features	0.82	0.72
Limiting trend features (Nbp, SPO2, Resp, Heart rate)	0.8	0.68
Waveform Only	0.77	0.62

What opportunities for training and professional development has the project provided?

Nothing to Report

How were the results disseminated to communities of interest?

Nothing to Report

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

1. Additional machine learning model tuning and addition of deep learning approaches will be employed to maximize the prediction of LSI and the need for evacuation, with preference for minimizing input data necessary to achieve acceptable prediction accuracy
2. Implementation of Lifeware hardware for prospective validation
3. Commence training for STAT MedEvac crews for use of the Lifeware devices
4. Begin prospective enrollment of patients with Lifeware devices and Zoll derived waveform data capture

4. IMPACT:

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

Nothing to Report

What was the impact on other disciplines?

Nothing to Report

What was the impact on technology transfer?

Nothing to Report

What was the impact on society beyond science and technology?

Nothing to Report

5. CHANGES/PROBLEMS:

DUA is now in place, and we are back on schedule.

Changes in approach and reasons for change.

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

Lifeware has switched from a disposable product to non-disposable patch. This has resulted in a slight delay in starting prospective enrollment has they are produced but now have a bulk manufacturing process with quality control with will enhance reliability of signals obtained. This also requires additional training and process for recovery and cleaning by the STAT MedEvac crews but is similar to other non-disposable equipment. Despite this we still anticipate meeting timely target enrollment goals.

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

Nothing to Report

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

Nothing to Report

Journal publications.

Nothing to Report

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

Nothing to Report

Other publications, conference papers and presentations.

Presentation of RAPTER project to MED CDID visiting group 18 Jan, 2023 in Pittsburgh, PA. Presentation of RAPTER project to SOCOM/AFSOC/AFWERX visiting group 28 Apr 2022.

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

Nothing to Report

7. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS

What individuals have worked on the project?

Name:	Francis X. Guyette, MD
Project Role:	Co-Principal Investigator
Research Identifier:	guyefx
Person months worked:	0.60
Contribution to Project:	Dr. Guyette oversees the entire project and has worked on the IRB/HARPO and DUA submission this quarter.
Name:	Joshua Brown, MD
Project Role:	Co-Principal Investigator
Research Identifier:	brownjb
Person months worked:	3.00
Contribution to Project:	Dr. Brown contributes his expertise in prehospital trauma care and statistical design/analysis. He has worked on the submission of the IRB/HARPO and DUA this quarter
Name:	Clifton Callaway, MD
Project Role:	Co-Investigator
Person months worked:	0.12
Contribution to Project:	Dr. Callaway provided experience for safe and rigorous conduct of the prospective prehospital trial as well as high level guidance on clinical models.
Name:	Jonathan Elmer, MD
Project Role:	Co-Investigator
Person months worked:	1.20
Contribution to Project:	Dr. Elmer assists in the featurization and development of triage algorithms.
Name:	David Salcido, PhD
Project Role:	Co-Investigator
Person months worked:	3.00
Contribution to Project:	Dr. Salcido preforms data management, signals analysis and featurization.
Name:	Leonard Weiss, MD
Project Role:	Co-Investigator
Person months worked:	1.20
Contribution to Project:	Dr. Weiss is responsible for clinical contextualization and featurization of data.
Name:	Michael Pinsky, MD
Project Role:	Co-Investigator
Person months worked:	0.60
Contribution to Project:	Dr. Pinsky provides expertise for study design and data annotation

Name:	Gilles Clermont, MD
Project Role:	Co-Investigator
Person months worked:	0.60
Contribution to Project:	Dr. Clermont provides oversight for the machine learning elements.
Name:	Jason Sperry, MD
Project Role:	Co-Investigator
Person months worked:	0.12
Contribution to Project:	Dr. Sperry contributes his expertise in trauma resuscitation and study management.
Name:	Ronald Poropatich, MD
Project Role:	Co-Investigator
Person months worked:	0.24
Contribution to Project:	Dr. Poropatich is the medical liaison to the S&T and advanced development community and helps with data analysis.
Name:	Chase Zikmund
Project Role:	Data Manager
Person months worked:	2.00
Contribution to Project:	Mr. Zikmund is the Data Manager he is responsible for curating and managing the matched and featurized physiologic signals data from the phase 1 retrospective study. He also archive and manage the signals data from the prospective validation in phase 2.

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

GUYETTE, FRANCIS

NEW – Dr. Guyette had 3 grants funded not listed as pending on prior Other Support

Title:	LITES T010 CAlcium and VAsopressin following Injury Early Resuscitation (CAVALIER) Trial
Major Goals:	The major goal of this grant is a prospective multicenter randomized interventional trial to examine the efficacy and safety of early vasopressin and/or Ca+ infusion as compared to standard care early whole blood transfusion in patients following traumatic injury is needed. Current TCCC guidelines state that one gram of calcium (30 ml of 10% calcium gluconate or 10 ml of 10% calcium chloride) should be administered IV/IO after the first transfused product.
Project Number:	W81XWH-16-D-0024
PD/PI:	Sperry/Guyette

Source of Support:	US Army Medical Research Acquisition Activity
Start/End Date:	09/22/22 – 09/22/26
Total Award (w/IDC)	
Effort:	2.50%
Title:	Engaging Cooperative Sites for Trial Acceleration, Trust, Innovation, and Capability (ECSTATIC)
Major Goals:	The major goal of this project is as part of the Trial Innovation Center (TIC), The University of Vanderbilt will work with The University of Pittsburgh to implement the aims of the program, with a particular focus on supporting consultations associated with Clinical Coordinating Centers/Data Coordinating Centers.
Project Number:	U24TR004437
PD/PI:	Bernard/Lindsell/Self
Source of Support:	Vanderbilt University/NIH/NCATS
Start/End Date:	10/01/23 – 04/30/28
Total Award (w/IDC)	
Effort:	2.50%
Title:	Sensor observed Treatment, Annotation and Timing (STAT)
Major Goals:	The major goal of this grant is to develop a de-identified, large-volume, multimodal field-through-trauma-bay dataset that will enable future identification of physiological features of injury that predict medical needs and resources.
Project Number:	HR00112320015
PD/PI:	Guyette/Salcido
Source of Support:	DARPA
Start/End Date:	04/14/23 – 10/13/26
Total Award (w/IDC)	
Effort:	5.00%

AWARDED – Dr. Guyette had 2 grants funded - listed as pending on prior Other Support

Title:	Cold-Sleep for Long-duration Spaceflight
Major Goals:	The major goal of this project is to address two major challenges to deep space exploration. First, psychological stresses on crewmembers will result from prolonged confinement during monotonous portions of the mission. Second, extended space missions will benefit from conservation of resources.
Project Number:	NNX16AO69A
PD/PI:	Callaway
Source of Support:	Baylor College of Medicine/TRISH/NASA
Start/End Date:	06/01/22 – 05/31/24
Total Award (w/IDC)	
Effort:	3.50%

Title:	Strategies to Innovate Emergency Care Clinical Trials Network (SIREN) Pittsburgh
Major Goals:	To conduct multicenter clinical trials related to emergency care. The clinical site will coordinate recruitment at several spokes in the clinical trial, and participate in all of the trials in the network.
Project Number:	1U24NS100656
PD/PI:	Callaway
Source of Support:	NIH/NINDS/NHLBI
Start/End Date:	02/01/23 – 01/31/28
Total Award (w/IDC)	
Effort:	2.50%

NO COST EXTENSION (NCE) – Dr. Guyette had 3 in a NCE with Reduced Effort*

Title:	Autonomous diagnosis and management of the critically ill during air transport (ADMIT)
Project Number:	1R01HL141916-01A1
PD/PI:	Pinsky
Source of Support:	NIH/NHLBI
*Start/End Date:	04/10/19 – 03/31/24 NCE
*Effort:	0.85%

Title:	Real-time intervention to reduce fatigue among Emergency Medical Service Workers
Project Number:	5R01OH011502
PD/PI:	Patterson
Source of Support:	CDC/NIOSH
*Start/End Date:	08/01/19 - 07/31/24 NCE
*Effort:	3.50%

Title:	Trauma Care in a Rucksack (TRACIR)
Project Number:	W81XWH-19-C-0101
PD/PI:	Poropatich
Source of Support:	US Army/DoD
*Start/End Date:	05/21/19 – 5/20/24 NCE
*Effort:	0.85%

ENDED – Dr. Guyette had 5 grants end

Title:	LITES Task Order 001: Linking Investigations in Trauma and Emergency Services (LITES) Network
Project Number:	W81XWH-16-D-0024

Title:	LITES Task Order 002: Linking Investigations in Trauma and Emergency Services (LITES) Network "Shock Whole blood and Assessment of TBI (SWAT)"

Project Number:	W81XWH-16-D-0024-0002
Title:	Generalized learning for POCUS AI with clinician heuristics
Project Number:	HR00112190075
Title:	Strategies to Innovate EmeRgENcy Care Clinical Trials Network (SIREN) – Pittsburgh
Project Number:	1U24NS100656
Title:	CDC-IPA: Guyette
Project Number:	20IPA2014138

BROWN, JOSHUA

NEW – Dr. Brown had 2 grants funded not listed as pending on prior Other Support

Title:	LITES Task Order 5 Prehospital Airway Control Trial (PACT)
Major Goals:	Aim 1: To compare the effect of initial endotracheal intubation (ETI) vs. initial supraglottic airway (SGA) upon 24-hour survival after traumatic injury. Aim 2: To compare the effect of initial endotracheal intubation (ETI) vs. initial supraglottic airway (SGA) upon hospital survival after traumatic injury. Aim 3: To compare the effect of initial endotracheal intubation (ETI) vs. initial supraglottic airway (SGA) upon major adverse events (airway injury pneumonitis, pneumothorax, sepsis, acute lung injury) after traumatic injury.
Project Number:	W81XWH-16-D-00240426
PD/PI:	Sperry/Guyette
Source of Support:	US Army Medical Research Acquisition Activity
Start/End Date:	09/30/18 – 12/22/23
Total Award (w/IDC)	
Effort:	5.00%
Title:	Sensor observed Treatment, Annotation and Timing (STAT)
Major Goals:	The major goal of this grant is to develop a de-identified, large-volume, multimodal field-through-trauma-bay dataset that will enable future identification of physiological features of injury that predict medical needs and resources.
Project Number:	HR00112320015
PD/PI:	Guyette/Salcido
Source of Support:	DARPA
Start/End Date:	04/14/23 – 10/13/26
Total Award (w/IDC)	
Effort:	25.00%

ENDED – Dr. Brown had 1 grant end

Title:	Volume Outcome Link in Trauma for Emergency Medical Services (VOLT-EMS)
Project Number:	C. James Carrico Faculty Research Fellowship

CALLAWAY, CLIFTON

NEW – Dr. Callaway had 1 grant funded not listed as pending on prior Other Support

Title:	Optimal timing of prehospital advanced airway management and epinephrine administration for out-of-hospital cardiac arrest
Major Goals:	The major goal of this project is to identify the optimal timing of advance life support (ALS) interventions for patients with out-of-hospital cardiac arrest (OHCA), into AAM and pediatric population, analyzing the ROC data.
Project Number:	R21HL167166
PD/PI:	Okubo
Source of Support:	NIH
Start/End Date:	12/15/22 – 11/30/24
Total Award (w/IDC)	
Effort:	0.05%

AWARDED – Dr. Callaway had 5 grants funded - listed as pending on prior Other Support

Title:	Cold-Sleep for Long-duration Spaceflight
Major Goals:	The major goal of this project is address two major challenges to deep space exploration. First, psychological stresses on crewmembers will result from prolonged confinement during monotonous portions of the mission. Second, extended space missions will benefit from conservation of resources.
Project Number:	NNX16AO69A
PD/PI:	Callaway
Source of Support:	Baylor College of Medicine/TRISH/NASA
Start/End Date:	06/01/22 – 05/31/24
Total Award (w/IDC)	
Effort:	In-Kind

Title:	Strategies to Innovate Emergency Care Clinical Trials Network (SIREN) Pittsburgh
Major Goals:	To conduct multicenter clinical trials related to emergency care. The clinical site will coordinate recruitment at several spokes in the clinical trial, and participate in all of the trials in the network.
Project Number:	1U24NS100656
PD/PI:	Callaway
Source of Support:	NIH/NINDS/NHLBI
Start/End Date:	02/01/23 – 01/31/28

Total Award (w/IDC) Effort:	12.00%
Title:	Strategies to Innovate Emergency Care Clinical Trials Network (SIREN) Clinical Coordinating Center
Major Goals:	The SIREN is to conduct multicenter clinical trials rfelated to emergency care. The coordinating center provides oversight, design and conduct support to clinical enrolling sites.
Project Number:	2U24NS100659
PD/PI:	Barsan/Silbergleit/Callaway
Source of Support:	University of Michigan/NIH/NHLBI
Start/End Date:	02/01/23 – 01/31/28
Total Award (w/IDC) Effort:	20.00%
Title:	Electrocardiographic Detection of Non-ST Elevation Coronary Events for Accelerated Classification of Chest Pain Encounters (ECG-SMART)
Major Goals:	The primary goals are to deploy and benchmark an intelligent ECG interpretation system in real-time; build a multi-task, interpretable, and clinically-actionable intelligent decision support system (IDSS); and demonstrate external validity of this IDSS across two Emergency Medical Service (EMS) systems (Pittsburgh EMS at University of Pittsburgh and Orange County EMS at UNC).
Project Number:	2R01HL137761
PD/PI:	Al-Zaiti
Source of Support:	NIH/NHLBI
Start/End Date:	07/01/22 – 06/30/27
Total Award (w/IDC) 0.50%	subaccount Effort:
Title:	Phenotyping Of Survivors Recovery Trajectories in the ICECAP Trial (POST-ICECAP)
Major Goals:	The goal of this project is to further the line of research to demonstrate that physiological signatures can be used to target precision medicine. This approach would be paradigm-changing and has broad implications for other acute diseases.
Project Number:	1R01NS127959-01A1
PD/PI:	Agarwal
Source of Support:	Columbia University/NIH
Start/End Date:	06/01/23 – 05/31/28
Total Award (w/IDC) 15.00%	subaccount Effort:

ENDED – Dr. Callaway had 5 grants end

Title:	Emergency Medicine Research Training

Project Number:	1T32HL134615
Title:	ACTIV Integration of Host-targeting Therapies for COVID-19 Administrative Coordinating Center
Project Number:	1OT2HL156812
Title:	Strategies to Innovate Emergency Care Clinical Trials Network (SIREN) Clinical Coordinating Center
Project Number:	1U24NS100659
Title:	Strategies to Innovate Emergency Care Clinical Trials Network (SIREN) Pittsburgh
Project Number:	1U24NS100656
Title:	Stroke Trials Network-Regional Coordinating Center, University of Pittsburgh (STN-UP)
Project Number:	5U24NS107216

CLERMONT, GILLES

NEW – Dr. Clermont had 3 grants funded not listed as pending on prior Other Support

Title:	IP21-002, New Vaccine Surveillance Network
Major Goals:	We propose to conduct active, prospective, population-based surveillance to define the disease burden of these viruses, determine population-based incidence, characterize clinical features, course, and outcomes, and establish vaccine effectiveness of licensed and pending vaccines; the results will inform public health policies and interventions.
Project Number:	5U01IP001152-03
PD/PI:	Williams/Michaels
Source of Support:	CDC/NCIRD
Start/End Date:	09/01/21 – 08/31/26
Total Award (w/IDC):	
Effort:	10.00%
Title:	Electrocardiographic Detection of Non-ST Elevation Myocardial Events for Accelerated Classification of Chest Pain Encounters (ECG-SMART 2)
Major Goals:	To build and externally validate a multi-task, ECG-based intelligent decision support system; to build and deploy a real- time architecture for this intelligent system along with a clinician-facing graphical user interface platform; and to perform a prospective clinical validation of this intelligent ECG system, including silent deployment and evaluation at two clinical sites.
Project Number:	2R01HL137761-06

PD/PI: Al-Zaiti
Source of Support: NIH/NINR
Start/End Date: 07/01/22 – 06/30/26
Effort: 5.00%

Title: Learning alerting models for clinical care from EMR data and human knowledge
Major Goals: The current proposal brings the research program in bold new directions. Alerting models will be enhanced using a variety of tools, including automatic evaluation of performance and the inclusion of ICU-specific knowledge-base in addition to multi-domain, multi-resolution features derived from the EMR.
Project Number: 5R01EB032752-09
PD/PI: Hauskrecht/ Huang/Clermont
Source of Support: NIH
Start/End Date: 09/01/22 – 06/30/26
Total Award (w/IDC): Effort: 10.00%

ENDED – Dr. Clermont had 2 grants end

Title: Innovative method for real-time assessment of intracranial compliance
Project Number: R21NS115174

Title: Sepsis physiomarkers for appropriate risk knowledge of monitored patients in the ICU (SPARK-ICU)
Project Number: 1R01GM139967

ELMER, JONATHAN

NEW – Dr. Elmer had 2 grants funded not listed as pending on prior Other Support

Title: PREcision Care In Cardiac ArrEst (PRECICECAP) supplement
Major Goals: This project uses high-resolution multimodality monitoring data after cardiac arrest and advanced data analytics to identify clinical phenotypes with differential treatment responsiveness to hypothermia. Responsibilities for this project are overall leadership as PI and site-specific responsibilities to oversee all local scientific and administrative processes required to develop and maintain the electroencephalography (EEG) core.
Project Number: 1R01NS119825-02SA
PD/PI: Hirsch/Elmer
Source of Support: Stanford/NIH/NINDS
Start/End Date: 08/01/23 – 11/30/23
Total Award (w/IDC): subaccount Effort: 7.00%

Title:	Development of a serious game to measure physician implementation of trauma triage guidelines
Major Goals:	The goal of this grant is to develop a tool that can facilitate a targeted approach to implementation. that helps physicians and stakeholders to understand triage behavior will fill a critical gap in our ability to improve the implementation of clinical practice guidelines in trauma triage and therefore outcomes for elderly patients after injury.
Project Number:	R21AG081724
PD/PI:	Mohan
Source of Support:	NIH/NIA
Start/End Date:	05/01/23 – 02/28/25
Total Award (w/IDC):	subaccount
Effort:	5.00%

AWARDED – Dr. Elmer had 2 grants funded - listed as pending on prior Other Support

Title:	Using video games to increase implementation of clinical practice guidelines in trauma triage
Major Goals:	The main goal of this project is to a conduct a Type I hybrid effectiveness-implementation trial in which we test the effect of video game-based training on physician behavior to address the gap of appropriate triage of trauma patients over the age of 65.
Project Number:	R01AG076499-01A1
PD/PI:	Mohan
Source of Support:	NIH/NIA
Start/End Date:	09/01/22 – 08/31/24
Total Award (w/IDC):	
Effort:	5.00%

Title:	Strategies to Innovate Emergency Care Clinical Trials Network (SIREN) Pittsburgh
Major Goals:	To conduct multicenter clinical trials related to emergency care. The clinical site will coordinate recruitment at several spokes in the clinical trial, and participate in all of the trials in the network.
Project Number:	1U24NS100656
PD/PI:	Callaway
Source of Support:	NIH/NINDS/NHLBI
Start/End Date:	02/01/23 – 01/31/28
Total Award (w/IDC)	
Effort:	10.00%

ENDED – Dr. Elmer had 1 grant end

Title:	PREcision Care In Cardiac ArrEst (PRECICECAP) supplement
Project Number:	1R01NS119825-01SA

PINSKY

NEW – Dr. Pinsky had 3 grants funded not listed as pending on prior Other Support

Title:	Predicting Patient Instability Noninvasively for Nursing Care-3 (PPINNC-3)
Major Goals:	Build and validate an online classification system for CRI events.
Project Number:	2R01NR013912-08A1
PD/PI:	Al-Zaiti/Clermont
Source of Support:	NIH/NINR
Start/End Date:	02/01/22 – 11/30/25
Total Award (w/IDC)	
Effort:	3.70%

Title:	Sepsis physiomarkers for appropriate risk knowledge of monitored patients in the ICU (SPARK-ICU)
Major Goals:	The purpose of this study is to elucidate complex temporal trajectories and subtypes of sepsis using clinical data and granular time series hemodynamic data. In that effort, also elucidate novel physiomarkers to predict sepsis and host volume responsiveness.
Project Number:	1R01GM139967-01A1
PD/PI:	Kamaleswaran
Source of Support:	NIH/NIGMS
Start/End Date:	08/01/21 – 06/30/26
Total Award (w/IDC)	
Effort:	5.00%

Title:	Sensor observed Treatment, Annotation and Timing (STAT)
Major Goals:	The major goal of this grant is to develop a de-identified, large-volume, multimodal field-through-trauma-bay dataset that will enable future identification of physiological features of injury that predict medical needs and resources.
Project Number:	HR00112320015
PD/PI:	Guyette/Salcido
Source of Support:	DARPA
Start/End Date:	04/14/23 – 10/13/26
Total Award (w/IDC)	
Effort:	5.00%

NO COST EXTENSION (NCE) – Dr. Pinsky had 3 in a NCE with Reduced Effort*

Title:	Autonomous diagnosis and management of the critically ill during air transport (ADMIT)
Project Number:	1R01HL141916-01A1
PD/PI:	Pinsky

Source of Support:	NIH/NHLBI
*Start/End Date:	04/10/19 – 03/31/24 NCE
*Effort:	0.85%
Title:	Trauma Care in a Rucksack (TRACIR)
Project Number:	W81XWH-19-C-0101
PD/PI:	Poropatich
Source of Support:	US Army/DoD
*Start/End Date:	05/21/19 – 5/20/24 NCE
*Effort:	1.00%
Title:	Autonomous Delivery of Trauma Care in the Field – RoboTRAC
Project Number:	W81XWH18SBAA1
PD/PI:	Dubrawski
Source of Support:	DoD USAMRDC
*Start/End Date:	04/01/19 – 03/31/24 NCE
*Effort:	1.00%

POROPATICH, RONALD

NEW – Dr. Poropatich had 3 grants funded not listed as pending on prior Other Support

Title:	Sensor observed Treatment, Annotation and Timing (STAT)
Major Goals:	The major goal of this grant is to develop a de-identified, large-volume, multimodal field-through-trauma-bay dataset that will enable future identification of physiological features of injury that predict medical needs and resources.
Project Number:	HR00112320015
PD/PI:	Guyette/Salcido
Source of Support:	DARPA
Start/End Date:	04/14/23 – 10/13/26
Total Award (w/IDC):	
Effort:	10.00%
Title:	Repurposed metformin as a preventive therapeutic
Project Number:	W81XWH-22-9-0016
Role:	Co-Investigator
Source of Support:	MTEC
Start/End Date:	10/06/22 – 09/30/24
Total Award (w/IDC):	
Effort:	2.50%
Title:	Patient Specific 3D Guide Enabling Accurate High Tibial Osteotomy (HTO) Surgery for Unstable Arthritic Knees Leading to Timely Return to Pre-Injury Duty

Major Goals:	Specific Aim 1: To assess the accuracy of the 3D computerized and the 2D traditional methods for HTO to generate the alignment correction based on the planned correction. Specific Aim 2: To evaluate the ease of use of the 3D computerized and the 2D traditional methods for HTO. The objective of the evaluation is to ensure that no use-related risks, hazards or hazardous situations are present with HTO guides and surgical workflow. Specific Aim 3: To assess knee function before and after HTO in response to external loads when 3D computerized and the 2D traditional methods are utilized.
Project Number:	Pending
Role:	Co-Investigator
Source of Support:	ATI/USAMRDC
Start/End Date:	08/04/22 – 02/03/25
Total Award (w/IDC):	
Effort:	5.00%

AWARDED – Dr. Poropatich had 1 grant funded - listed as pending on prior Other Support

Title:	Towards High Resolution Vision Restoration by Optogenetic Therapy
Role:	Co-Investigator
Source of Support:	MTEC
Project Number:	MTEC-22-02-MPAI Number W81XWH-15-9- 000-
Performance Period:	07/15/2022 – 07/14/2024
Total Award (w/IDC):	
Effort:	5.00%

NO COST EXTENSION (NCE) – Dr. Poropatich had 3 in a NCE with Reduced Effort*

Title:	Autonomous diagnosis and management of the critically ill during air transport (ADMIT)
Project Number:	1R01HL141916-01A1
PD/PI:	Pinsky
Source of Support:	NIH/NHLBI
*Start/End Date:	04/10/19 – 03/31/24 NCE
*Effort:	8.00%

Title:	Trauma Care in a Rucksack (TRACIR)
Project Number:	W81XWH-19-C-0101
PD/PI:	Poropatich
Source of Support:	US Army/DoD
*Start/End Date:	05/21/19 – 5/20/24 NCE
*Effort:	8.00%

Title:	Autonomous Delivery of Trauma Care in the Field – RoboTRAC
Project Number:	W81XWH18SBAA1

PD/PI:	Dubrawski
Source of Support:	DoD USAMRDC
*Start/End Date:	04/01/19 – 03/31/24 NCE
*Effort:	1.00%

ENDED – Dr. Poropatich had 2 grants end

Title:	Optimizing a novel intraductal delivery of calcineurin inhibitors as a radiocontrast infusion formulation to prevent post-ERCP pancreatitis
Project Number:	NA

Title:	Enhancing Soldier Protection Against Evolving Threats
Project Number:	W911NF2120208

SALCIDO, DAVID

NEW – Dr. Salcido had 2 grants funded not listed as pending on prior Other Support

Title:	Sensor observed Treatment, Annotation and Timing (STAT)
Major Goals:	The major goal of this grant is to develop a de-identified, large-volume, multimodal field-through-trauma-bay dataset that will enable future identification of physiological features of injury that predict medical needs and resources.
Project Number:	HR00112320015
PD/PI:	Guyette/Salcido
Source of Support:	DARPA
Start/End Date:	04/14/23 – 10/13/26
Total Award (w/IDC):	
Effort:	10.00%

Title:	Efficacy of Double Sequential External Defibrillation (DSED) in the Wearable Cardioverter Defibrillator (WCD)
Major Goals:	The main goal of this grant is one-arm study will test the efficacy of DSED in a swine model of cardiac arrest. DSED performance, measured with an endpoint of DFT50 estimation, will be compared to historical performance of the HWD in its standard configuration.
Grant Number:	NA
PD/PI:	Salcido

Agency:	Zoll
Start/End Date:	08/01/23 – 07/31/24
Total Award (w/IDC):	
Effort:	5%

AWARDED – Dr. Salcido had 2 grants funded - listed as pending on prior Other Support

Title:	Evaluation of the Sotair safety accessory for manual bag-valve-mask ventilation
Major Goals:	This is a fee for service grant, animal studies will be conducted by Drs. Menegazzi and Salcido at the University of Pittsburgh, to test Sotair device on pigs because they have high similarity to human lungs. The primary endpoints will include key injury parameters (volume of gastric insufflation, lung injury score) as well as resuscitation outcomes (hemodynamics, cardiovascular collapse).
Project Number:	R44HL165932
PD/PI:	Prabhudesai, Prathamesh
Source of Support:	SafeBVM/NIH Phase 2
Start/End Date:	08/01/23 – 08/31/24
Total Award (w/IDC):	(subproject)
Effort:	20%

Title:	BASSO
Major Goals:	The major goal of this project is to establish preliminary feasibility of the single catheter SSO2 system for a cardiac resuscitation application under a controlled laboratory experimental setting in both the pulmonary artery and aortic arch.
Project Number:	NA
PD/PI:	Salcido
Source of Support:	Zoll Medical Corporation
Start/End Date:	02/09/23 – 05/08/24
Total Award (w/IDC):	
Effort:	5%

NO COST EXTENSION (NCE) – Dr. Salcido had 2 in a NCE with Reduced Effort*

Title:	Autonomous diagnosis and management of the critically ill during air transport (ADMIT)
Project Number:	1R01HL141916-01A1
PD/PI:	Pinsky
Source of Support:	NIH/NHLBI
*Start/End Date:	04/10/19 – 03/31/24 NCE
*Effort:	8.00%

Title:	Trauma Care in a Rucksack (TRACIR)
Project Number:	W81XWH-19-C-0101
PD/PI:	Poropatich
Source of Support:	US Army/DoD
*Start/End Date:	05/21/19 – 5/20/24 NCE
*Effort:	8.00%

ENDED – Dr. Salcido had 2 grants end

Title:	Evaluating Neuroprotective Therapies that Modulate Leukocyte Infiltration into the Brain Following Cardiac Arrest and Resuscitation
Project Number:	74774258.1
Title:	Investigation of a Novel Immunomodulatory Neuroprotective Therapy in a Murine Model of Sudden Cardiac Arrest
Project Number:	LAERDAL SALCIDO

SPERRY, JASON

NEW – Dr. Sperry had 1 grant funded not listed as pending on prior Other Support

Title:	LITES T010 CAlcium and VAsopressin following Injury Early Resuscitation (CAVALIER) Trial
Major Goals:	The major goal of this grant is a prospective multicenter randomized interventional trial to examine the efficacy and safety of early vasopressin and/or Ca+ infusion as compared to standard care early whole blood transfusion in patients following traumatic injury is needed. Current TCCC guidelines state that one gram of calcium (30 ml of 10% calcium gluconate or 10 ml of 10% calcium chloride) should be administered IV/IO after the first transfused product.
Project Number:	W81XWH-16-D-0024
PD/PI:	Sperry/Guyette
Source of Support:	US Army Medical Research Acquisition Activity
Start/End Date:	09/22/22 – 09/22/26
Total Award (w/IDC)	
Effort:	2.50%

ENDED – Dr. Sperry had 2 grants end

Title:	LITES Task Order 001: Linking Investigations in Trauma and Emergency Services (LITES) Network
Project Number:	W81XWH-16-D-0024-0001
Title:	LITES Task Order 002: Linking Investigations in Trauma and Emergency Services (LITES) Network "Shock Whole blood and Assessment of TBI (SWAT)"
Project Number:	W81XWH-16-D-0024-0002

WEISS, LEONARD

NEW – Dr. Weiss had 3 grants funded not listed as pending on prior Other Support

Title:	Sensor observed Treatment, Annotation and Timing (STAT)
Major Goals:	The major goal of this grant is to develop a de-identified, large-volume, multimodal field-through-trauma-bay dataset that will enable future

	identification of physiological features of injury that predict medical needs and resources.
Project Number:	HR00112320015
PD/PI:	Guyette/Salcido
Source of Support:	DARPA
Start/End Date:	04/14/23 – 10/13/26
Total Award (w/IDC)	
Effort:	5.00%
Title:	LITES T010 CAlcium and VAsopressin following Injury Early Resuscitation (CAVALIER) Trial
Major Goals:	The major goal of this grant is a prospective multicenter randomized interventional trial to examine the efficacy and safety of early vasopressin and/or Ca+ infusion as compared to standard care early whole blood transfusion in patients following traumatic injury is needed. Current TCCC guidelines state that one gram of calcium (30 ml of 10% calcium gluconate or 10 ml of 10% calcium chloride) should be administered IV/IO after the first transfused product.
Project Number:	W81XWH-16-D-0024
PD/PI:	Sperry/Guyette
Source of Support:	US Army Medical Research Acquisition Activity
Start/End Date:	09/22/22 – 09/22/26
Total Award (w/IDC)	
Effort:	5.00%
Title:	LITES Task Order 007: Type O Whole Blood assessment of Age and prehospital Resuscitation (TOWAR) Trial
Major Goals:	TOWAR will determine if the use of Prehospital Whole Blood Administration in trauma patients will reduce mortality as compared to fractionated blood products
Project Number:	W81XWH-20-F-0383
PD/PI:	Sperry/Guyette
Source of Support:	US Army/DoD
Project Start/End Date:	09/16/20 – 09/15/26
Total Award (w/IDC)	
Effort:	15.00%
NO COST EXTENSION (NCE) – Dr. Weiss had 3 in a NCE with Reduced Effort*	
Title:	Autonomous diagnosis and management of the critically ill during air transport (ADMIT)
Project Number:	1R01HL141916-01A1
PD/PI:	Pinsky
Source of Support:	NIH/NHLBI
*Start/End Date:	04/10/19 – 03/31/24 NCE
*Effort:	8.00%

Title:	Trauma Care in a Rucksack (TRACIR)
Project Number:	W81XWH-19-C-0101
PD/PI:	Poropatich
Source of Support:	US Army/DoD
*Start/End Date:	05/21/19 – 5/20/24 NCE
*Effort:	8.00%
Title:	Real-time intervention to reduce fatigue among Emergency Medical Service Workers
Project Number:	5R01OH011502
PD/PI:	Patterson
Source of Support:	CDC/NIOSH
*Start/End Date:	08/01/19 - 07/31/24 NCE
*Effort:	3.75%

ENDED – Dr. Weiss had 1 grants end

Title:	Generalized learning for POCUS AI with clinician heuristics
Project Number:	HR00112190075

What other organizations were involved as partners?

Noma AI Inc.
3700 Butler Street
Pittsburgh, PA 15201
Type: For Profit Corporation
Financial Support: annually for personnel costs
NOMA AI is a Pittsburgh based company that builds clinical decision support and patient monitoring tools using machine learning and artificial intelligence. The NOMA AI platform is designed to facilitate the development of real-time, bedside predictive models. Their solutions are modular allowing extendibility and reusability to minimize cost, enable rapid development and adapt to multiple environments. NOMA AI's tools are EHR agnostic and have automated platforms for data mapping, cleaning, and integration. They can also incorporate featurization into predictive models consistent with our proposed analysis plan. NOMA AI as their medical director and NOMA AI provides the technical expertise and manpower for computer coding and implementing the machine learning algorithms to predict life-saving interventions.

8. SPECIAL REPORTING REQUIREMENTS

COLLABORATIVE AWARDS:

Not Applicable

9. APPENDICES: Appendix #1: Updated Quad Chart page 28