



USU CENTERS

ANNUAL REPORT 2022



TABLE OF CONTENTS



Letter from the Associate Dean for Research and the Director of the Council of Center Directors.....	1
USU Hubs: Military Infectious Disease; Brain and Behavior; Combat Casualty Care	2
Armed Forces Radiobiology Research Institute (AFRRI).....	6
Center for Biotechnology (4D Bio ³).....	8
Center for Deployment Psychology (CDP).....	10
Center for Global Health Engagement (CGHE).....	12
Center for Health Professions Education (CHPE)	14
Center for Health Services Research (CHSR)	16
Center for Military Precision Medicine (CMPH)	18
Center for Neuroscience and Regenerative Medicine (CNRM)	20
Center for Rehabilitation Sciences Research (CRSR)	22
Center for the Study of Traumatic Stress (CSTS)	24
Consortium for Health and Military Performance (CHAMP).....	26
Defense and Veterans Center for Integrative Pain Management (DVCIPM)	28
DoD Medical Ethics Center (DMEC)	30
Infectious Disease Clinical Research Program (IDCRP).....	32
John P. Murtha Cancer Center Research Program (MCCRP)	34
National Center for Disaster Medicine and Public Health (NDCMPH)	36
Surgical Critical Care Initiative (SC2i)	38
Tri-Service Center for Oral Health Studies (TSCOHS)	40
Tri-Service Nursing Research Program (TSNRP)	42
Val G. Hemming Simulation Center (SimCenter).....	44

LETTER FROM THE ASSOCIATE DEAN FOR RESEARCH AND THE DIRECTOR OF THE COUNCIL OF CENTER DIRECTORS

The Uniformed Services University of the Health Sciences (USU) celebrated its 50th anniversary in 2022. It was truly a milestone to mark a half-century of training uniformed health professionals, scientists, and leaders to care for our service members and their families. We also welcomed our seventh President of USU, Dr. Jonathan Woodson, who previously served as the Assistant Secretary of Defense for Health Affairs and retired from the United States Army Reserve at the rank of Major General. Dr. Woodson brings profound knowledge and experience that will no doubt help to facilitate the mission of the Centers.

USU's Murtha Cancer Center Research Program—the DoD's only Center of Excellence for cancer care—also celebrated its 10th anniversary. A proclamation is currently being drafted for signature by senior leaders from Congress, the Department of Defense, Veterans Affairs, and the National Cancer Institute in recognition of the advanced cancer research and enhanced cancer care performed thus far.

In collaboration with the Veterans Health Administration (VHA) Office of Patient-Centered Care and Cultural Transformation, the USU Consortium for Health and Military Performance (CHAMP) hosted the Total Force Fitness to Whole Health (TFF-WH) summit at USU to promote a shared mission of optimizing the health and well-being of our service members and veterans across their lifecycle. With more than 300 participants, the virtual and in-person event was a great success.

Our continuing growth and progress at the USU Centers is reflected in the recent creation of three USU Hubs. The mission of the Hubs is to optimize healthcare in the Military Health System (MHS) by sharing resources, reducing silos, and presenting a unified approach for collaboration for our external partners. Each Hub focus area—Military Infectious Disease, Brain and Behavior, and Combat Casualty Care—has been identified by their significance within the MHS. A fourth Hub—Simulation and Education—is planned for the future.

The university, which now boasts more than 11,000 alumni, originally started with the School of Medicine and only 32 students. Since 1972, USU has grown into a valuable national asset with 20 uniquely positioned Centers. As we look ahead to next year and beyond, the USU Centers will continue to support the readiness of America's warfighters and the health and well-being of the military community.

Sincerely,



Wanda Salzer, Col, USAF, MC

Associate Dean for Research

Director, Council of Center Directors

F. Edward Hébert School of Medicine

Uniformed Services University of the Health Sciences



USU HUBS

MILITARY
INFECTIOUS
DISEASE

BRAIN AND
BEHAVIOR

COMBAT
CASUALTY
CARE

MISSION

The mission of the USU Hubs is to optimize healthcare for the warfighter in the Military Health System (MHS).


VISION

The USU Hubs will be recognized by the Department of Defense (DoD) as the leading academic organization for coordinating all healthcare-related needs within the MHS.

OVERVIEW

The premise for the USU Hubs, which are part of the USU School of Medicine, is to share resources, decrease silos, and present a unified picture to external partners. The focus areas of the individual Hubs—military infectious disease, brain and behavior, and combat casualty care—have been identified by their significance within the MHS. A fourth hub—Simulation and Education—is planned for the future.

With their unique access to the resources of the DoD, in conjunction with the resources of other federal and civilian partners, the Hubs offer superior healthcare support for active-duty service members, veterans, and DoD beneficiaries. By embracing an entrepreneurial and creative spirit, the Hubs will distinguish themselves and accelerate progress that enhances the MHS and the military.



MILITARY INFECTIOUS DISEASE HUB

The Military Infectious Disease (MID) Hub is designed to facilitate innovative research collaboration among multidisciplinary scientists from all relevant USU departments as well as with outside collaborators. To identify the most critical research goals, the MID Hub focused on several key questions based on military relevance and existing capability gaps:

- *What is the best way to mitigate the impact of Post-COVID Condition?* Addressing this question requires multi-disciplinary collaborations to refine definitions into clinical phenotypes, identify predictive factors, and evaluate interventions for prevention and treatment.
- *What research platforms can be put in place now to be ready to immediately characterize and develop countermeasures against the next pandemic infection?* The MID Hub will develop a cohort study that may be activated immediately upon recognition of future potential pandemics and make steps to form a contingency interventional trial network.
- *What is the best way to mitigate the impact of antimicrobial resistance?* Solving this challenge will require multidisciplinary research to define prevalence, to develop novel diagnostics and antimicrobial agents, and to assess adherence to and the effectiveness of existing management systems, as well as the rational evolution of stewardship programs.

Based on the questions posed above, the MID Hub has identified three primary areas of research as its priorities:

1. Studying the impact of Post-COVID Condition
2. Developing countermeasures against the next pandemic
3. Mitigating the impact of antimicrobial resistance



BRAIN AND BEHAVIOR HUB

The operational goal of the B&B Hub is to build a network of pre-clinical and clinical researchers that fosters interdisciplinary collaboration. Individuals, centers, and departments at all levels of training are invited to share their recent findings and perspectives on research questions. In addition, the B&B Hub is committed to amplifying individuals from groups that are historically underrepresented in academic science.

Through the creation of this network, the long-term goal is to drive research and discovery that can reduce the effects of brain injury and stress and improve health and chronic disease outcomes that affect the DoD community. These project areas are informed by multi-domain operations and the changing nature of war, which is sadly reflected in Ukraine. Future conflicts can be expected to prompt new brain health needs. These conflicts may result in yet unknown brain exposures due to new extreme military environments.

Based on the assessment above, the B&B Hub has identified seven primary research areas:

1. Traumatic brain injury (blast, injury, concussion prevention, recovery, and treatment)
2. Acute stress reaction (response, regulation, trajectories, recovery, treatment, and disorders)
3. Cardiovascular disease and stress/PTSD
4. Post-Covid syndromes and brain health
5. Sleep (illness, regulation, and health modulation)
6. Performance optimization (cognitive function, management of subclinical symptomatology, including somatic, emotional, social, psychological, and positive mental health)
7. Pain (disorders, comorbidities, and treatments)

COMBAT CASUALTY CARE HUB

The Combat Casualty Care (CCC) Hub is designed to serve the needs of the DoD and the MHS to improve healthcare for military beneficiaries, especially casualties of war and domestic terrorism. It represents a collaborative team of laboratories, programs, centers, and investigators. A non-exhaustive list of collaborators includes:

- Surgical Critical Care Initiative
- 4DBio3 Center for Biotechnology
- Center of Rehabilitation Sciences Research
- Battlefield Shock and Organ Support
- Military and Emergency Medicine and Surgery Simulation
- Course Development and Training Programs
- Defense and Veterans Integrative Center for Pain Management
- DoD Limb Optimization and Osseointegration Program
- Musculoskeletal Injury Rehabilitation Research for Operational Readiness
- Surgery and Extremity Trauma and Amputation Center of Excellence
- Regenerative Medicine and Cell Biology Laboratories

Possessing the full spectrum of capabilities for bench to bedside combat care, the CCC Hub has identified seven research areas as its priorities:

1. Precision medicine, artificial intelligence/machine learning, biomarker-driven development of clinical decision support tools, and novel treatment strategies to predict and mitigate sequelae of combat-related or severe traumatic injury.
2. Prevention and treatment of catastrophic traumatic hemorrhage, including resuscitation and monitoring modalities, isolated limb perfusion, ischemia-reperfusion injury mitigation, and prolonged field care scenarios.
3. Tissue regeneration and 3D bioprinting for volumetric muscle, red cell manufacture, and articular tissue damage or loss, as well as non-surgical regenerative medicine interventions.
4. Clinical limb restoration and optimization following severe extremity trauma, inclusive of both the limb salvage and amputation reconstructive pathways.
5. Developing cutting-edge rehabilitation interventions and technologies to improve wounded warrior outcomes, including orthobiologics, virtual reality, wearable systems, and neuroprosthetic interfaces.
6. Improving education and training by using advanced technologies for surgical and medical simulation and assessments to increase realism and readiness.
7. Improve pain control and management to decrease pain severity and chronification through narcotic-sparing, multi-modal, interventional, and non-interventional techniques, including novel agents, therapies, and neuromodulation.

ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE



DIRECTOR: MOHAMMAD NAEEM, MBBS, M.D., FCCP, FACR, COL, MC, USA

education, and operational response. AFRRRI is committed to being medically and operationally prepared to save lives and achieve positive long-term health outcomes, while preserving operational force strategic resilience and fighting strength in future nuclear contaminated multi-domain and multi-operational battlespaces. We envision a strong committed engagement of valor, agility, dedication, and strength to outperform our last 60 years of time-sensitive support to the Department of Defense (DoD) mission. AFRRRI will continue its invaluable support by developing warfighter-friendly tactical and strategic reach-back tools, applying knowledge through education, and developing state-of-the-art deployable tools and countermeasures.

MISSION

The mission of the Armed Forces Radiobiology Research Institute (AFRRRI) is to defend the nation from nuclear and radiological threats through research, leadership, training, and education. AFRRRI is a unique national asset responsible for preserving and protecting the health and performance of U.S. military personnel that operate in radiologically contaminated multi-domain conventional or hybrid battlespaces, as well as urban environments. Through research, education, and operational training, AFRRRI advances understanding of the effects of ionizing radiation in line with the 21st century dynamic threat landscape as well as a understanding of national security threats posed by non-state actors, hostile state actors, and near peer adversaries. AFRRRI also provides rapidly deployable radiation medicine and health physics expertise in response to radiological or nuclear events domestically or abroad, and develops agile, creative, and adept Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) leaders.

VISION

AFRRRI is committed to be medically and operationally prepared to preserve operational force resilience and fighting strength in the event of adversarial deployment of nuclear weapons. AFRRRI promulgates and operates with the vested ethos of workforce diversity, integrity, dignity, and respect, while engaging in cutting edge strategic research,

OVERVIEW

AFRRRI was established by DoD Directive in 1961 and operated by the Defense Atomic Support Agency and the Defense Nuclear Agency through the Cold War. In 1993, in accordance with a DoD Directive, AFRRRI was realigned with USU. AFRRRI is the most powerful radiobiological research agency in the western world with six decades of active, robust, and outstanding support to the DoD through research, reach-back, and education. It is the only DoD medical research and development facility dedicated solely to nuclear and radiological defense that has conducted research from the Cold War to the current conflict at the borders of eastern Europe and everything in between, such as the 2001 anthrax attacks, the 2011 Fukushima nuclear scare, and the 2019 SARS-CoV-2 novel coronavirus pandemic.

AFRRRI is a unique facility that houses a 1.1-megawatt Training, Research, Isotopes, General Atomics (TRIGA) nuclear research reactor, a clinical linear accelerator (LINAC), a computed tomography (CT) scanner, a small animal radiation research platform (SARRP) and two cobalt-60 irradiators to support the work of highly distinguished scientists. AFRRRI has the capability to start, stop, or redirect lines of effort as needed, under the guidance of its Director of Science, to produce maximal value to DoD from AFRRRI activities. AFRRRI capabilities include developing and sustaining training, collaboration, and coordination in radiobiology, radiation physics, nuclear engineering, and relevant military and social sciences with other federal and civilian research institutions, and those of allied and partner nations.

TOP **AFRRI** DELIVERABLES

1. Return to Operations of the U.S. Department of Defense's Only Nuclear Research Reactor (Materiel Solution)

After remaining non-operational for six years, the AFRRI 1.1 TRIGA reactor resumed operations on July 25, 2022. The reactor is housed in a deep open pool of purified water and can simulate the radiation emitted from the detonation of a nuclear weapon. With the resumption of the reactor operations, we are able to directly support operational military forces with critical nuclear understanding, technological support, and application development, should service members become exposed to radiation on the battlefield.

2. Landmark Collaboration with the U.S. Intelligence Community (Materiel Knowledge)

AFRRI subject matter experts established the first interagency agreement with the Intelligence Advanced Research Projects Activity (IARPA) under the Office of the Director of National Intelligence. IARPA sponsors AFRRI's cutting-edge low-dose ionizing radiation and biodosimetry research in support of the national requirement to investigate individuals exposed to low-dose ionizing radiation. The AFRRI-IARPA Targeted Evaluation of Ionizing Radiation Exposure Program aims to establish novel avenues away from current biodosimetry approaches, which suffer from several constraints, such as the need for invasive and/or serially collected samples and high-throughput triage.

3. Improving Nuclear Survivability in the Arctic (Materiel Solutions)

The Joint Project Manager for Protection under the Joint Program Executive Office for Chemical, Biological, Radiological, and Nuclear Defense invited the AFRRI Military Medical Operations team to the Joint Base Elmendorf-Richardson in Anchorage, Alaska, to participate in the joint exercise Arctic Eagle Patriot 2022. The objective of this exercise involved assessing non-aqueous technologies and procedures to meet established task requirements and operational viability to decontaminate particulate contaminated casualties and mitigate CBRN response, medical, and cold weather operational gaps. AFRRI scientists and military professionals provided invaluable support in collecting operational data, user feedback, and role-player feedback.

4. Medical Care Post Nuclear Detonation, a Tabletop Exercise Supporting the COCOMS (Materiel Solutions)

AFRRI military and civilian staff were invited by the Institute of Defense Analyses (IDA) to participate in a tabletop exercise for CBRN preparedness and responses. The IDA tabletop exercise models and simulations reflected scenarios relevant to battlefield planning, improving human response estimates for personnel risk and casualty criteria for nuclear weapons effects, and other military doctrines. AFRRI supported the IDA tabletop exercise by providing a critical assessment of CBRN preparedness, mitigation/deterrence/responses, and capabilities essential to successfully using or denying effective nuclear weapons.

5. AFRRI Contribution to the Federal Guidance for Response to a Nuclear Detonation (Materiel Knowledge)

In 2019, AFRRI personnel were key members of the Federal Emergency Management Agency CBRN Office Interagency Working Group to update federal guidance in response to a nuclear detonation. In May 2022, the revised 3rd edition was released, which provided guidance for a greater range of nuclear explosions. This book delivers nuclear detonation information and context to enable planners, responders, and leaders to enhance their existing capabilities. This 3rd edition focuses on the first 24 to 72 hours after a detonation when early actions can save lives.



DIRECTOR: VINCENT HO, M.D., MBA

MISSION

To support and enhance the readiness, health, and well-being of America's warfighters, veterans, and their families through innovation, modernization, and translation of state-of-the-art biomedical technologies and services.

VISION

To be a DoD Center for Technology aligned under USU and the central hub within DoD for biotechnology research, innovation, and medical translation for the uniformed services.

OVERVIEW

The Center for Biotechnology (4D Bio3) was established to accelerate development, application, and operational translation of promising advanced biotechnologies to meet DoD operational priorities and requirements. Through intra- and extra-mural partnerships, 4D Bio3 facilitates the adaptation and adoption of novel biotechnology for optimization to warfighter health, readiness, and lethality. 4D Bio3 by design is able to investigate biotechnology solutions at any technology or manufacturing readiness level.

Over the past two decades, there has been an explosion of advanced biotechnologies in the fields of advanced diagnostics, additive manufacturing, bioprinting, artificial

intelligence, systems biology, proteomics, genomics, therapeutics, and microbiome. It is imperative that the next generation of military leaders, notably uniformed and DoD civilian physicians, nurses, scientists, technicians, and medics gain meaningful exposure to and training in these cutting-edge biotechnologies.

The Center champions a multi-disciplinary approach that combines various DoD, federal and non-federal experts across research, healthcare, and bioengineering fields. The three main mission domains for 4D Bio3 are: 1.) research, scholarship, and technology development; 2.) operational support and translation; and 3.) education and training.

4D Bio3 has three main research lines-of-effort:

- Readiness ("Warfighter Assessment of Readiness Needs" or WARN)
- Austere Biotechnology ("For Austere Military Environments" or FAME)
- On-Demand Blood (ODB)

In addition to tailored educational programs for USU graduate students (M.D., Ph.D., and M.S.), the Center also supports STEM initiatives, notably for the service academies (i.e., U.S. Military Academy West Point, U.S. Air Force Academy, and U.S. Naval Academy), enlisted workforce development, and diversity STEM recruitment.

TOP 4D BIO³ DELIVERABLES

1. Austere Manufacturing (Materiel and Knowledge Products)

The Center partnered with Expeditionary Medicine Logistics in Support of NATO Operations under the FAME program during a military exercise in Norway. The 4D Bio³ team deployed two 3D printers during a U.S. Navy exercise to a pre-positioned Expeditionary Medical Facility in Norway above the Arctic Circle in conjunction with NATO allies (Figure 1). This work built upon previous successes in austere manufacturing using advanced 3D printers equipped also for 3D bioprinting that were conducted in an austere desert environment and onboard the International Space Station. The team demonstrated the capability to 3D print replacement parts for medical equipment and consumable parts for medical care in an austere arctic military environment using a thermoplastic extrusion printer. In addition, the utility of 3D printing was made clear through an unplanned use-case scenario. A broken knob essential for operation of local Norwegian equipment was 3D scanned, a digital model created, and a functional new part 3D printed. Total avoided replacement costs were approximately \$900. Military partners commented that benefits of our demonstrated additive manufacturing would be even more pronounced in austere contested logistics scenarios in which supply chains are often challenging. Using a second 3D bioprinter, the team demonstrated printing of a meniscal scaffold from an alginate and nanofibrillated cellulose bioink. The high fidelity print closely matched the 3D design. In addition, the team 3D printed a bandage consisting of a thermoplastic backing and a hydrogel containing exosomes that promote wound healing. Norwegian military officers participated in this demonstration and were shown how exosomes could be re-suspended and mixed with a bioink to enable bioprinting of the bandage.



2. Operational Medicine (Materiel and Knowledge Products)



In partnership with the 59th MDW SGO, BAMC, 4D Bio³ developed and supported the Validated Assessment Program for Operational Readiness (VAPOR) program that executed four Role 1-5 Integrated Missions in 2022. The missions included members from HHS, Texas Air National Guard (TxANG), 59th MDW SGO, BAMC, and Texas A&M. Each exercise (Figure 2) lasted approximately six hours and started at point-of-injury through the care continuum with a civilian site landing and patient/team exchange. These training exercises demonstrate a comprehensive collaboration between civilian and federal entities required during mass casualty

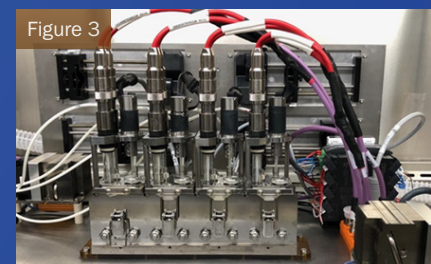
and natural disaster events as well as operational medicine technology integration across the continuum.

3. Technology Operational Assessment (Materiel and Knowledge Products)

4D Bio³ completed first Science and Technology Assessments for DTRA JSTO and JPEO at Technology and Operational Readiness Center for Health (TORCH) immersed within Field Training Exercise in San Antonio, Texas. Also included independent assessment of Medical and D-CON Teams of three products over a one and a half-day exercise. The first day consisted of D-CON units and second half-day consisted of assessment by Role 1-3 end users.

4. On-Demand Blood (Materiel and Knowledge Products)

Developed characterization and quality protocols for human manufactured Red Blood Cells (mRBCs). Assays included two methods of assessing oxygen carrying capacity and cell deformability measurement. In 2022, the ODB consortium achieved densities of RBC progenitor cells in a novel, expandable voxelized bioreactor (Figure 3) and have maintained these densities during the final stages of RBC maturation. Purified mRBCs were transferred across Bethesda, Maryland, Orlando, Florida, and the United Kingdom for functional analysis for key RBC characteristics, such as mRBC deformability, hemoglobin content, and oxygen affinity equilibrium curves. Testing of mRBCs from all sites have resulted characteristics similar to donated human RBCs, suggesting functional equivalence to mRBCs produced in vivo.



5. On-Demand Blood (Materiel and Knowledge Products)

Human neutrophils were successfully manufactured and adaptation of a mobile bioreactor for their production was initiated. Giemsa staining on day 14 cells indicated the presence of cells with distinguishable nuclear lobes for neutrophils (Figure 3). This year the sites in the United Kingdom and in Orlando, Florida also tested the expansion of adult NK cells and T cells in the bioreactor. Further optimization of these protocols is ongoing.

CENTER FOR DEPLOYMENT PSYCHOLOGY



(Screen shot of suicide prevention interactive, experiential learning software.)

DIRECTOR: DAVID RIGGS, PH.D.

MISSION

The mission of the Center for Deployment Psychology (CDP) is to lead the development of a community of culturally mindful and clinically competent providers through the delivery of high-quality training and education, the convening of experts, and the dissemination of research-based treatment and the latest topics in military behavioral health.

VISION

CDP will be the central hub for the Military Health System in the development and implementation of behavioral health training and education to clinicians in order to ensure that all service members, veterans, and their families receive quality behavioral healthcare that meets their unique needs.

OVERVIEW

Since 2006, CDP has led the development of a community of culturally mindful and clinically competent providers to support the well-being, recovery, resilience, and readiness of service members, veterans, and their families. CDP provides high-quality training and education, convenes civilian and military experts to inform the behavioral healthcare of military members, and disseminates research-based treatment and the latest topics in military behavioral health. CDP has developed a portfolio of professional education programs to train and educate behavioral healthcare providers. To date, over 96,000 providers have been trained on topics including military culture, military family resilience, and evidence-based psychotherapies for clinical issues, such as suicide prevention, depression, insomnia, and post-traumatic stress disorder (PTSD) among service members and veterans.



TOP **CDP** DELIVERABLES

1. **Ukraine Healthcare Provider Support** (Knowledge Solution)

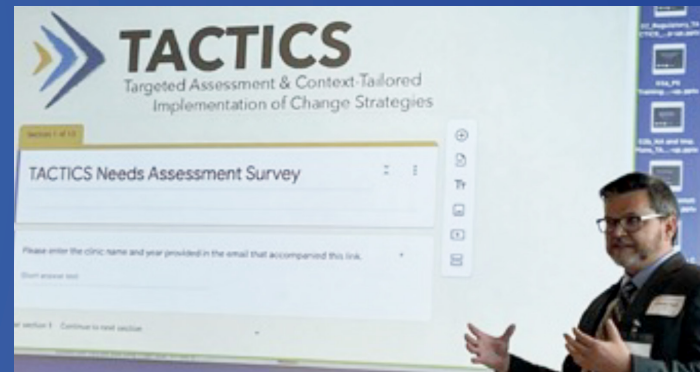
To support behavioral health professionals in Ukraine, CDP responded to two requests to facilitate evidence-based, trauma-informed behavioral health practices in armed conflict settings involving both military and civilian (including pediatric) populations. In March 2022, CDP led a collaborative effort with Division 19 of the American Psychological Association and a colleague from the National Center for PTSD in developing a suite of tools to support behavioral health service provision in crisis and acute stress situations. Materials reached the National Psychological Association of Ukraine within days of the initial request. To supplement the request, a website was developed with content on trauma-informed care.

2. **Pathways to Military Internships: The Summer and Winter Institute** (Knowledge Solution)

For the past seven years, CDP hosted a five-day course at USU called Pathways to Military Internships: The Summer Institute. In addition, CDP introduced its inaugural three-day virtual Winter Institute this past year as a means of expanding this unique training opportunity to more doctoral students by offering a condensed version of the curriculum online and at a different time of the year. The goal of the Pathways program is to foster the interest of clinical and counseling psychology doctoral students in a military psychology career. Students from across the United States come together (virtually or in-person) to explore the opportunities offered by military internships and gain knowledge of the roles psychologists have in the armed forces.

3. **Targeted Assessment and Clinic-Tailored Implementation of Change Strategies** (Knowledge Solution)

After working together for five years, the CDP's collaborative research project—the Targeted Assessment and Clinic-Tailored Implementation of Change Strategies (TACTICS) study—came to a conclusion. Since 2017, CDP and its partners aimed to leverage the latest dissemination and implementation of scientific strategies to help Military Treatment Facilities (MTFs) improve their ability to use evidence-based practices (EBPs) for PTSD, particularly Prolonged Exposure (PE) therapy.



4. **Second Life Island to Prevent Suicide** (Knowledge Solution)

Two years ago, CDP received an intramural grant to develop and test an asynchronous, immersive, interactive learning environment for training behavioral health providers in Cognitive Behavioral Therapy for Suicide Prevention. The first phase of the project was completed in 2022 and consisted of the development and construction of the Second Life Island to Prevent Suicide (SLIPS). Housed in virtual reality platform Second Life, the virtual environment gives behavioral health providers a unique opportunity to extend their learning from a standard didactic two-day training workshop in suicide prevention skills into an immersive learning experience.

5. **DoD Child Collaboration Study** (Knowledge Solution)

In 2022, CDP continued a study with the Kennedy Krieger Institute examining the viability and best practices for enhancing and expanding capabilities to deliver telehealth services to military children with developmental, emotional, and behavioral health needs. The study utilizes the Project ECHO® model to help children by connecting geographically dispersed civilian experts in childhood neurobehavioral disorders with military healthcare providers (i.e., pediatricians, family medicine providers, and behavioral providers) on-site in a Military Treatment Facility or with community-based providers near the installation.

CENTER FOR GLOBAL HEALTH ENGAGEMENT



DIRECTOR: DANNY SHIAU, M.D., MPH, CAPT, MC, USN

MISSION

To serve as a thought leader providing academic and operational support to the Department of Defense (DoD) Global Health Engagement (GHE) enterprise to better meet national security objectives.

VISION

By the end of calendar year 2026, the Center for Global Health Engagement (CGHE) will be nationally and internationally recognized as a leading institution within the DoD for global health and health security.

OVERVIEW

In the final weeks of 2022, the DoD released the latest version of DoD Instruction (DoDI) 5105.45, which expanded USU's mission and directed it to provide GHE-related support to the Office of the Assistant Secretary of Defense for Health Affairs (OASD(HA)), the Joint Staff, the Combatant Commands (CCMDs), the Services, and other DoD entities. CGHE was thus presented with an explicit mission statement, stated in the DoDI as conducting professional development, research, knowledge management, assessment, monitoring, evaluation, and operational support. While only published this year, the instruction was the culmination of many years of strategic planning, showcased through the CGHE charter and strategic plan, following an ever-evolving path while keeping the Center aligned to its primary objectives, the USU mission, and DoD requirements.

This year, CGHE has maintained this forward-leaning posture and continued to develop capacities to meet our two primary lines of effort: training and engagements as well as research and scholarship. There is no better example of the Center's efforts as the successful completion of the deliverables outlined below. As a force multiplier and knowledge hub, CGHE will continue to be shaped not only by the direction and guidance of the DoD, but by the evolving strategic environment of our military missions as well as national and regional interests. Using a mission-oriented approach, CGHE—with USU oversight—will continue to focus on the priority requirements of today while continuing to shape ideas and consultative services in line with future demands.



TOP **CGHE** DELIVERABLES

1. **Global Health Security (GHS) (Knowledge Solution)**

CGHE's GHS support to U.S. Indo-Pacific Command has included providing policy analysis, forward planning, coordination with the interagency and other partners, implementation, and external messaging. The Center supported the second Military Civilian Health Security Summit in Singapore to advance international norms and standards to promote military-civilian cooperation in GHS. CGHE also supported OASD(HA) with the seventh Global Health Security Agenda Ministerial Meeting 2022 in Seoul, South Korea, which featured multisectoral delegations from over 38 countries, 11 multilateral organizations, and private sector entities.

2. **African Partner Outbreak Response Alliance (APORA) Program Evaluation (Knowledge Solution)**

CGHE initiated the APORA evaluation study for U.S. Africa Command (USAFRICOM) with a research design approach framed by collaboration theory to map APORA's support for sustainable military-to-civilian multi-sectoral alliances, and the procedural, structural, and interpersonal elements and processes that exist for impactful military-civilian pathways. The evaluation team attended a workshop for Rapid Response Team training in Accra, Ghana, where they collected interview and questionnaire data from participants, Partner Nation (PN) leaders, and Ministry of Defense and Ministry of Health stakeholders, which were used to generate the final report in January 2023.

3. **African Peacekeeping Rapid Response Partnership (APRRP) Program (Materiel Solution)**

CGHE completed the USAFRICOM-sponsored APRRP Medical program whose purpose was to assist Ghana, Uganda, Rwanda, and Senegal to successfully deploy Level-2 Hospitals registered at the Rapid Deployment Level in the United Nations Peacekeeping Capability Readiness System. Uganda is now in the process of deploying, Rwanda is under consideration for a second deployment, and both Ghana and Senegal deployed to support peacekeeping missions. CGHE worked with PN senior medical leadership to ensure continuity and sustainability.

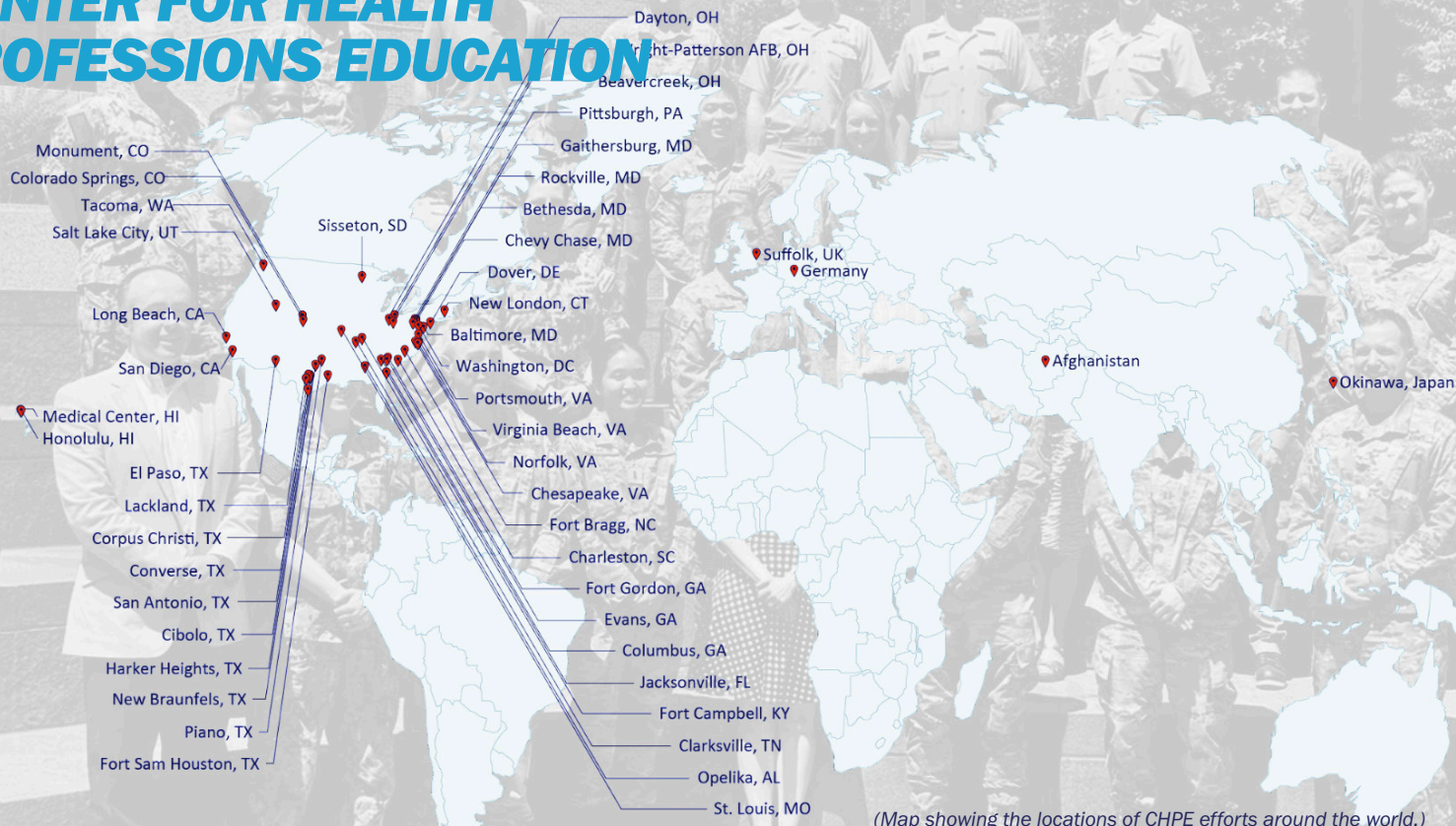
4. **DoD GHE Training Activities (Knowledge Solution)**

CGHE executed nine virtual Fundamentals of Global Health Engagement courses as well as two in-person—one was in collaboration with the United Kingdom's Center for Defense Health Engagement and the Canadian Armed Forces and another was part of Continuing Promise 2022. CGHE also delivered its Global Health Strategies for Security course and helped plan and execute two joint Global Health Engagement Orientation courses. CGHE also spearheaded planning for the GHE track of USU's Operation Bushmaster as well as the Summer Operational Experience in GHE.

5. **Medical Evaluations Describing Interoperability Capability Assessment Levels of Partner Trauma Institutions or Non-Battle Injury Services (MEDICAL OPTIONS) (Knowledge Solution)**

CGHE completed the MEDICAL OPTIONS Needs Assessment, including: a content analysis of existing medical capability surveys; focus groups with individuals who contribute to or use these surveys; and a literature review to identify best practices. The assessment had the following key findings: consider establishing a collaborative depot for storing and archiving medical capability surveys, consider developing training on how to conduct medical capability surveys, consider creating a standardized template and guidance to facilitate information collection.

CENTER FOR HEALTH PROFESSIONS EDUCATION



(Map showing the locations of CHPE efforts around the world.)

DIRECTOR: STEVEN J. DURNING, M.D., PH.D., MACP

MISSION

The mission of the Center for Health Professions Education (CHPE) is to be the premier provider of health professions education for the Military Health System (MHS), Public Health Service (PHS), Veterans Health Administration (VHA), and civilian communities through leadership in teaching, research, mentoring, service, and innovation. More specifically, CHPE aims to enhance workforce development across the MHS by providing advanced education (e.g., graduate certificates and degrees) to active duty and civilian faculty stationed at military treatment facilities (MTFs) across the country, consulting with faculty on enhancing their instruction for distance delivery and conducting important educational research in the MHS.

VISION

The vision of CHPE is to be widely recognized as a global leader for the MHS, PHS, VHA, and civilian communities in advancing health professions education (HPE) through leadership in teaching, research, and innovation.

OVERVIEW

Through leadership in education, scholarship, and innovation, CHPE provides the direct benefit to the uniformed services and other federal agencies by producing a cadre of leaders to advance the field of health professions education. We offer primarily online programs with multiple options (certificates through degrees in a stacked or nested approach where courses in the certificate program are part of the degree program, see figure below) to best meet the needs of our MHS learners as busy health professionals. CHPE achieves this mission by building education, research, and leadership capacity through the mentoring of health professional trainees (e.g., medical students and residents) and faculty members; generating new knowledge in HPE through research and innovative educational practice; developing a collaborative community of inter-professional scholars and educational leaders in HPE; providing faculty support and consultation on curriculum development and innovative instructional strategies; and engaging in education-related knowledge translation activities with the potential to improve patient care. CHPE has several core activities, including: graduate programs in CHPE (certificates as well as masters and doctorate degrees in HPE); Long-Term Career Outcome Study (LTCOS); the Distance Learning Lab; as well as multiple programs of research and educational consultations.

TOP CHPE DELIVERABLES

1. Growing Alumni Impact: (Knowledge Solution)

We educate health professionals to become premier academic leaders in the MHS. All of our nearly 40 degree graduates are serving in leadership roles within the MHS in over 55 MTFs around the world. We have also graduated over 90 faculty learners from the certificate programs. The leadership roles occupied by these degree and certificate graduates include program directors, deans, and service chiefs. By providing the MHS with a cadre of educated health professions leaders serving around the world, CHPE is moving the field forward. Over 75 percent of graduates have expressed their intent to remain in the military based on their experiences in the program.

2. Innovative Research (Knowledge Solution)

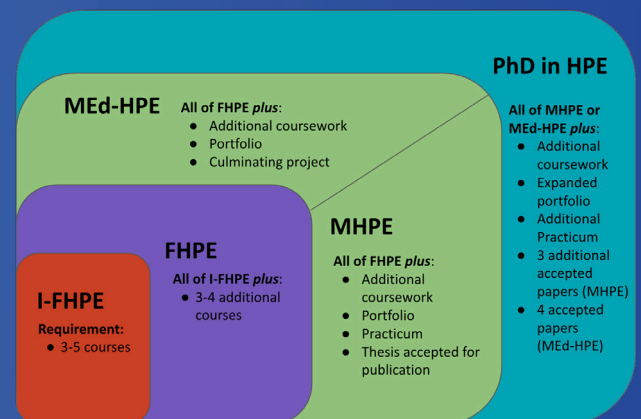
CHPE research moves the field forward by generating an evidence base to inform how we can best educate health professionals to ensure the ability of all MHS health professionals who care for those in harm's way. CHPE research has explored the acquisition of competency across the continuum of education as well as many other areas including exploring medical error, provider well-being, and enhancing diversity, equity, and inclusion. Our research productivity continues to rival top health professions education units internationally.

3. Distance Learning Lab (Knowledge and Material Solution)

The Distance Learning (DL) Lab continues to play a critical role in the redesign of education as a response to the pandemic and in relation to the evolving expectations of education delivery by learners, faculty, and accreditors. The DL Lab serves faculty university-wide. Key projects include Military Modules for HPSP learners that cover principles of military leadership. We also designed and implemented faculty development for all incoming GSN and Dental College faculty. Additionally, the DL Lab has served over 600 faculty in hands-on workshops and personalized consultations. The DL Lab creates high-quality, accessible training content and resources and investigates best practices for delivery serving as a model for the varied and critical training needs across the MHS, meeting the learner where they are and with what they need.

4. Enhancing Educational Partnerships (Knowledge Solution)





CHPE has continued to enhance its educational partnership. For example, CHPE has two inter-agency agreements (IAAs) with the VHA. One is to build a leadership curriculum for their Designated Educational Officers who are senior academic leaders in their system (equivalent to MHS DIOs). This curriculum is aimed at educating and retaining individuals in these leadership positions. The second IAA enables VHA faculty to enroll in our degree programs, including our new Masters of Education in HPE that focuses on the scholarship of teaching and learning and designing innovations to benefit the MHS and beyond. These initiatives will enhance our connections and grow collaborative opportunities.



5. Evidence informed Education (Knowledge Solution)

LTCOS plays a key role in providing evidence to inform School of Medicine education. It is a multi-departmental team that produced a Military Medicine special edition to assist with upcoming Middle States and LCME accreditation visits. LTCOS also won funding from the American Association of Colleges of Osteopathic Medicine to study Osteopathic Recognition nationally. These investigations should enhance the quality of education at USU and beyond, which can translate to better care in the future.

2022 Year in Review

Policy Impacts	Presentations	New Projects	Publications	Education	Students
<p>9 Policy Impacts</p>  <p>Research from CHSR impacted 9 policy decisions</p>	<p>22 Presentations</p>  <p>CHSR gave 22 presentations at 3 conferences and 3 invited events</p>	<p>5 Major Projects</p>  <p>CHSR oversaw 5 major research projects/programs</p>	<p>14 Publications</p>  <p>CHSR had 14 articles published/in press</p>	<p>485 Attendees Educated</p> <p>CHSR educated 485 attendees throughout 2022 at workshops & the bi-monthly HSR Interest Group, which has 122 members</p>	<p>29 Students in Training</p> <ul style="list-style-type: none"> • 19 MPH • 1 MHAP • 1 DrPH • 4 PhD Public Health • 2 PhD Clinical Psychology • 1 PhD Nursing • 2 MD

DIRECTOR: TRACEY PEREZ KOEHLMOOS, PH.D., MHA

MISSION

The Center for Health Services Research (CHSR) supports the readiness of America's warfighter and improved outcomes for the military community by building capacity throughout the Military Health System (MHS) to conduct health services research that support MHS goals, DoD's mission, and the national security strategy.

VISION

By the end of calendar year 2024, CHSR will be nationally recognized as the leader in MHS Health Services Research. We will produce actionable, outcomes-based policy recommendations and direct support that will improve health outcomes throughout the MHS.

OVERVIEW

CHSR is a requirements-driven initiative developed in direct response to the 2014 MHS Review. This document identified a critical gap in the ability of the MHS to use its wealth of data for decision making and iterative learning and recommended a dedicated program of training and analytics to build this capacity for current and future efforts. CHSR's

core funded team of eight staff members develops the necessary capacity and produces timely, relevant, translatable findings to support the MHS and the nation through the following avenues:

- Education and training: Providing training opportunities for those who support military Health Services Research (HSR), educating students and faculty in HSR methods, and supporting researcher access to grants and awards.
- Research: Conducting research that measurably supports the MHS strategic goals and objectives and contributes to learning and policy across the MHS, as well as expanding USU's HSR capacity, and becoming recognized as the thought leader for military HSR across MHS, the DoD, and the nation.
- Direct support services: Responding to requirements and ad hoc queries generated from organizations and units within the DoD and the MHS, particularly emerging HA/DHA priorities, and establishing enduring relationships with MHS customers.
- Service to the nation: Support to civilian HSR organizations as well as to interagency and national efforts on demand, including the Department of Veterans Affairs and the White House.

TOP **CHSR** DELIVERABLES

1. **Knowledge Translation (Materiel/Knowledge Solution)**

Knowledge translation is the process of moving research from the scientific journal and academic conference into the hands of people and organizations who can put it to practical use. CHSR is committed to not only conducting high quality research, but also ensuring that the research we conduct results in evidence-based policies. In 2022, CHSR ramped up its knowledge translation efforts, resulting in nine documented policy impacts. CHSR knowledge translation efforts align with the Center's vision of producing actionable, outcomes-based policy recommendations.

2. **Launch of the Fetal Alcohol Spectrum Disorders Project (Materiel/Knowledge Solution)**

In partnership with FASD United, Boston University, and Madigan Army Medical Center, CHSR is investigating the impact of FASD across the clinical spectrum on military families. This work will model factors that may be used to identify at-risk children for FASD screening in the MHS. Rates of children living with FASD may be higher among children in the MHS than the general population, given a pervasive drinking culture among active-duty service members.

3. **Direct Support to the Secretary of Defense (Materiel/Knowledge Solution)**

CHSR provided direct support to a pressing, high-priority issue for the Secretary of Defense by participating in an Independent Review with the Office of the Joint Staff Surgeon from June-July 2022. The recommendations of the report were favorably received and adopted by DoD leaders. The CHSR Director was awarded the Joint Civilian Service Commendation Medal for meritorious achievement. Providing direct support services epitomizes the vision of CHSR. Professor Koehlmoos's work embodied this vision and demonstrates the importance of health services research and the CHSR to the MHS and the nation.

4. **Racial Disparities in the MHS (Knowledge Solution)**

CHSR published an article that synthesized a body of literature produced by CHSR research teams highlighting the mitigation of racial disparities in the MHS and TRICARE. This work was twice requested for briefing to the Defense Health Board in 2022 and prompted their call for request for a full board report focused on racial disparities in the MHS. CHSR pioneered work demonstrating that many racial disparities are ameliorated in the MHS. While additional disparities work is necessary to understand those differences that remain, that universal health coverage can mitigate disparities in a U.S. population is a lesson from the MHS to the nation.

5. **MHS Data Use Training and Consultation (Knowledge Solution)**

The 2022 education and training offerings by CHSR included two virtual and two in-person faculty development seminars and workshops on the MHS Data Repository, Genesis, and the DaVINCI joint DoD-VA clinical intelligence database. The Center also provided data consultations with USU, MTF-based practitioners, and others across the DoD enterprise. CHSR's data training and expertise constitutes an enterprise-wide resource and significant capacity building effort to meet current and future needs of the MHS and the nation through ensuring the ability to generate timely, evidence-based, actionable findings to support policy and decision-making affecting care for our warfighters and their families.

CENTER FOR MILITARY PRECISION HEALTH



DIRECTOR: CLIFTON DALGARD, PH.D., CLS

MISSION

The mission of the Center for Military Precision Health (CMPH) is to conduct innovative research to apply genomic science, discoveries, and precision techniques to enhance the health, readiness, and well-being of the warfighter and the community of Department of Defense (DoD) beneficiaries.

VISION

By the end of 2024, CMPH will be a central hub for collaborative genomics research, education, and treatment in military medicine. CMPH will be a CLIA-certified and CAP-accredited organization: capable, accurate, informative, and secure for personalized genetics-based care and genomics studies in military populations.

OVERVIEW

CMPH provides standardized genome profiling services, genomic data analysis, and genomic data storage under DoD security and privacy compliance policies. It addresses eight separate DoD requirements across the Military Health System (MHS). In addition, CMPH also provides education in genomic information and performs clinical implementation research in the field of genomic medicine to inform policy and clinical practice guidelines for use of genomics in the MHS. Within CMPH, the Military Cardio-

vascular Outcomes Research (MiCOR) Program addresses gap areas identified in the Initial Capabilities Document for Cardiovascular Care.

DoD-centric cohorts have been studied in terms of their association with post-traumatic stress disorder (PTSD), major depressive disorder, cardiovascular disease, pulmonary disorders (including chronic obstructive pulmonary disease or COPD), lung cancer and other cancers, traumatic brain injury, dementia, and other disorders. To date, CMPH has completed genomic and transcriptomic profiling on over 120,000 samples. In 2022, MiCOR completed screening of NDAA directed cardiac screening of 3,600 academy recruits.

Current projects focus on the cardiovascular consequences of traumatic brain injury and the integration of pharmacogenomics into the MHS. In response to the COVID-19 pandemic, CMPH scientists are collaborating with the National Institute of Allergy and Infectious Diseases, the National Cancer Institute, and the DoD to provide state-of-the-art next generation sequencing and analysis of individuals with COVID-related illness. MiCOR has completed two projects assessing the arrhythmic risk associated with COVID and its therapies, as well as initiated a third to assess “return to duty” protocols following COVID hospitalization.

TOP **CMPH** DELIVERABLES

1. **Comprehensive Proteogenomic Analysis and Classification of Lung Adenocarcinoma** (Knowledge Product)

Through the Applied Proteogenomic Organizational Learning and Outcomes (APOLLO) research network, CMPH utilized five molecular profiling technologies—DNA whole genome sequencing, RNA sequencing, total and phospho-proteomics by mass spectrometry, and reverse phase protein arrays (RPPA)—to characterize a longitudinally-annotated cohort of 87 lung adenocarcinomas. Several molecular characteristics were found to significantly predict patient outcomes, including RNA expression subtype classification against metastasis-free survival.

2. **Immunopathological Signatures in Multisystem Inflammatory Syndrome in Children and Pediatric COVID-19** (Knowledge Product)

A minority of SARS-CoV-2-infected children may develop multisystem inflammatory syndrome in children (MIS-C), with significant morbidity. In this longitudinal multi-institutional study, CMPH applied multi-omics (analysis of soluble biomarkers, proteomics, single-cell gene expression profile, and immune repertoire) to profile children with COVID-19 and MIS-C, along with pediatric healthy controls. The results identified distinct immunopathological signatures in pCOVID-19 and MIS-C, which may help better guide therapy.

3. **Unexpected Frequency of the Pathogenic AR CAG Repeat Expansion in the General Population** (Knowledge Product)

CAG repeat expansions in exon 1 of the AR gene on the X chromosome cause spinal and bulbar muscular atrophy, a male-specific progressive neuromuscular disorder associated with a variety of extra-neurological symptoms. CMPH established a pipeline, which combines the use of the Expansion Hunter tool and visual validation, to detect AR CAG expansion on whole-genome sequencing data, benchmarked it to fragment PCR sizing, and applied it to unrelated individuals from four large cohorts. Modelling using the novel mutation frequency led to estimate disease prevalence of 1:6,887 males, more than four times more frequent than the reported disease prevalence.

4. **Association Between Traumatic Brain Injury and Subsequent Cardiovascular Disease Among Post 9/11-Era Veterans** (Knowledge Product)

Traumatic brain injury (TBI) was common among U.S. service members deployed to Iraq and Afghanistan. Results of this cohort study suggest that U.S. veterans with a TBI history were more likely to develop CVD compared with veterans without a TBI history. Given the relatively young age of the cohort, these results suggest that there may be an increased burden of CVD as these veterans age and develop other CVD risk factors. Future studies are needed to determine if the increased risk associated with TBI is modifiable.

5. **CMPH Clinical Genetic Support Service** (Materiel Solution)

Advances in next generation sequencing (NGS) methodologies have enabled genetic testing by decreasing time for molecular diagnosis and increasing diagnostic yield. Whole genome sequencing (WGS) addresses many technical limitations of amplification and enrichment-based genetic testing approaches, yet consensus best practices for analytical validation of WGS have not been fully defined. Furthermore, secondary findings are frequently observed in research-only genomic approaches. Return of secondary findings are recommended and defined by a standing ACMG panel. In 2022, 231 DoD service member and beneficiary cases have been analyzed across three separate research projects. Among these, 45 cases with returnable variants have been identified and are in the process of being returned to enhance clinical outcomes.

CENTER FOR NEUROSCIENCE AND REGENERATIVE MEDICINE



DIRECTORS: BRADLEY A. DENGLER, M.D. LTC, MC, USA

MISSION

To conduct cutting-edge research, with an emphasis on clinical trials, to improve outcomes for U.S. service members who have sustained traumatic brain injuries.

VISION

To build a substantial evidence base that enhances the Department of Defense’s clinical practice guidelines for traumatic brain injury diagnosis and treatment.

OVERVIEW

The Center for Neuroscience and Regenerative Medicine (CNRM) is a U.S. military traumatic brain injury research program that is organized as a partnership between USU and the National Institutes of Health (NIH). The Center conducts rigorous science, with an emphasis on clinical trials, to improve the lives of U.S. warfighters who have sustained traumatic brain injuries (TBIs). CNRM clinical trials explore novel treatments for TBI-related sequela, such as depression, headaches, and insomnia. The Center’s work informs methods that optimize a warfighter’s brain health and treatments that help injured warfighters recover quickly and fully. CNRM is well-supported and well-equipped to fulfill its mission. Since inception in 2008, the Center has conducted more than 135 studies and enrolled more than 9,000 research participants. CNRM has 19 active protocols that are conducted at 16 sites throughout CONUS. Its team is comprised of more than 20 senior scientific investigators

and 70 expert support staff. CNRM has the state-of-the-art tools and onsite capabilities needed to conduct robust, world-class U.S. DoD-centric TBI research. The Center’s in-house informatics core, biomarkers core, clinical trials unit, and program management team propel our research and provide critical support to external efforts throughout the broader DoD TBI research community. CNRM is serious about its work because its staff knows it can make a difference in the lives of warfighters with TBI.



2023 CLINICAL STUDY SITES



TOP **CNRM** DELIVERABLES

1. Investigating the Effects of Repetitive, Subconcussive Blast Exposure (Knowledge Solution)

Warfighters, especially those in Special Operations, can experience repeated subconcussive blast exposures (RSCBE) when using high explosives and heavy weapon systems. The short- and long-term effects of these exposures are not fully understood. CNRM's Investigating Training Associated Blast Pathology (INVICTA) study informs this knowledge gap by serially assessing the acute, subacute, and chronic impact RSCBE has on brain function in Special Operators during Heavy Weapons Training. Through February 2022, INVICTA has assessed 77 of a target 300 participants. Preliminary analyses indicate blast exposure is associated with a consistent pattern of statistically significant changes in several measures of brain function, including verbal learning, tactile discrimination, and gait, within minutes to hours, with a return to baseline performance within hours to days. Continued data collection will enhance power and ascertain whether chronic repetitive exposure is associated with longer-term impairment.

2. Non-Pharmacologic Intervention for Military TBI-Related Depression (Knowledge/Materiel Solution)

Warfighters who have sustained a TBI are susceptible for depression. According to a 2019 U.S. Military Health System report, 48,449 active-duty warfighters were diagnosed with depressive disorders in 2017. Current treatments for depression have a moderate 40-60 percent efficacy rate, necessitating continued research for improved and additional treatment options. CNRM's ADEPT trial aims to optimize the health and readiness of warfighters who are experiencing symptoms of depression after a concussion. This large-scale, multi-site, randomized, double-blinded interventional clinical trial investigates the efficacy, safety, and tolerability of several repetitive transcranial magnetic stimulation device protocols.

3. Drug Trial of Acute Response Tactics (Knowledge Solution)

Post-traumatic headache (PTH), a secondary headache that develops within seven days after injury, is the most common symptom of TBI. The prevalence of PTH is approximately 58 percent throughout the first year and up to 33 percent five years post-mild TBI. There are no approved treatments specifically for PTH and treatments for other headache disorders are only moderately effective. CNRM is conducting the first randomized, placebo-controlled clinical trial to investigate the efficacy of a CGRP receptor blocking monoclonal antibody for the preventive treatment of PTH in warfighters. If successful, this treatment would be among the first evidence-based approaches to reduce or eliminate the most common symptom of TBI.

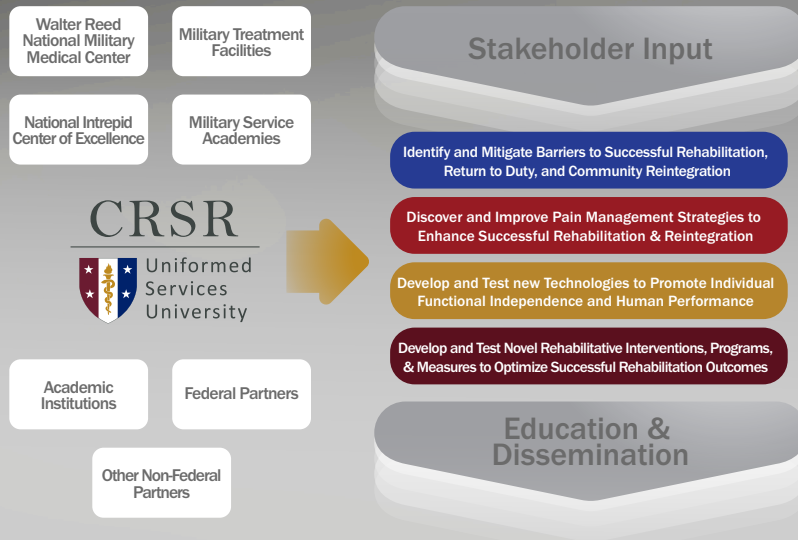
4. Nationwide Partnerships (Knowledge Solution)

CNRM is branching outside its Washington, D.C. area headquarters and partnering with six military treatment facilities throughout CONUS to create a network for multicenter randomized clinical trials among warfighters with TBI. These sites include Brooke Army Medical Center, Fort Belvoir Community Hospital, Naval Medical Camp Lejeune, Walter Reed National Military Medical Center, William Beaumont Army Medical Center, and Womack Army Medical Center. Additional sites are expected to include the 96th Medical Group Eglin Air Force Base, Naval Hospital Camp Pendleton, and Naval Medical Center San Diego. This CNRM-initiated site network would be one of the DoD's first networks dedicated to conducting large-scale, multicenter military-related TBI clinical research.

5. Remote Digital Therapeutics (Knowledge and Materiel Solution)

CNRM has three clinical trials that are conducted 100 percent virtually by mail, telephone, and secure internet. These trials use app-based digital therapeutics to deliver evidence-based therapeutic interventions for TBI-related insomnia, depression, and headaches. CNRM innovated two of these applications and collaborated with the University of Virginia to modify an existing application, making it more reflective of experiences within the warfighter community. Compared to traditional, in-person clinical trials, studies involving digital therapeutics can be deployed on a much larger scale, to a broader participant base, at a lower cost. These trials are amenable to warfighters with dispersed geographical locations and unique schedules. With CNRM's virtual trials, participants have the opportunity to participate in groundbreaking TBI research via a tablet or smart device from any location throughout CONUS.

CENTER FOR REHABILITATION SCIENCE RESEARCH



DIRECTOR: PAUL PASQUINA, M.D., COL, MC, USA (RET)

MISSION

The Center for Rehabilitation Sciences Research (CRSSR) leads synergistic rehabilitation-related translational research efforts within the Military Health System and disseminates knowledge to the community, in order to maximize functional recovery and promote the successful return to duty and community reintegration of injured service members, especially those with severe combat-related trauma.

VISION

CRSSR will be a global leader in advancing rehabilitative care for individuals with war-related trauma.

OVERVIEW

During military operations in Iraq and Afghanistan, more than 55,000 U.S. service members have been wounded in action, many surviving severe blast-related polytrauma that would have been fatal in prior conflicts. More than 1,700 service members have sustained at least one major extremity amputation, and over 380,000 service members have been diagnosed with one or more traumatic brain injuries (TBIs), with half of these also suffering from symptoms of comorbid post-traumatic stress disorder (PTSD). While advances in military medicine have led to historically high survival rates on the battlefield, continued work is needed to maximize recovery after injury and enhance rehabilitation interventions. CRSSR was

established to promote the advancement of rehabilitative care for service members. Since its inception, CRSSR has supported the development of critical innovations in military medicine, as well as the improvement of rehabilitative treatment and technologies for those with amputation, TBI, limb dysfunction, paralysis, complex pain, and/or psychological injury. Headquartered at USU, with strong partnerships across many military treatment facilities, academic institutions, and other federal and non-federal organizations, CRSSR facilitates team-based science through interdisciplinary clinical and scientific collaborations to solve clinically relevant rehabilitation challenges and optimize patient outcomes.

In executing the mission, CRSSR concentrates its research, education, and leader development in the following four focus areas:

1. Identify barriers to successful rehabilitation, return to duty, and community reintegration, in order to develop mitigation strategies to foster recovery.
2. Advance pain management strategies to allow maximum participation in rehabilitation, prevent chronic pain, and reduce opioid dependency.
3. Apply the latest technologies, particularly in assistive technology, prosthetics, robotics, and regenerative medicine, to improve human performance and individual functional independence.
4. Develop and employ novel rehabilitative interventions, strategies, and programs to foster and measure functional restoration, recovery from injury, and quality of life.

TOP **CRSR** DELIVERABLES

1. **Heterotopic Ossification Model** (Knowledge and Materiel Solution)

Heterotopic ossification (HO) occurs in approximately 65 percent of wounded service members with limb loss or major extremity injuries. Extensive data collected over the past 15 years has uncovered factors that may act as catalysts for inducing HO: 1.) a blast injury that displaces bone and/or fragments; 2.) tourniquet and negative pressure wound therapy usage; and 3.) a post-traumatic infection signal. Research using data from a large animal ovine model has been recognized in two blast injury editions to the Army Surgeon General and at numerous national conferences. In addition, CRSR designed an orthopedic implant (patent pending) to stop HO growth at the time of injury. Early findings in ovines show that no HO is present when compared to positive controls at three months post-injury. This is a landmark finding, and histological and radiographic data will continue to be collected in the coming months to assess the impact of this intervention for military care.

2. **Pain Management Collaboratory Coordinating Center (PMC3)** (Knowledge Solution)

PMC3 is an interagency initiative established in 2017 and focused on nonpharmacological approaches for pain management for service members and veterans. PMC3 provides national leadership and serves as a national resource for the development and refinement of innovative tools, best practices, and other resources in the conduct of high-impact pragmatic clinical trials (PCTs). The CRSR team leads a core component of PMC3, the Military Treatment Facility Engagement Committee (MTFEC), which consists of experts from across DoD services who bring a wealth of experience in the execution of pain-management related clinical trials and provides support to PMC3 and four PCTs. As of 2022, all four PCTs are actively enrolling participants at performance sites, including eight MTFs and five civilian sites.

3. **Regenerative Rehabilitation Laboratory: 3D Bioprinting** (Materiel Solution)

A major focus area within the lab is in the area of 3D printing and bioprinting of various biomaterials and the development of bioinks, such as collagen, to fabricate peripheral nerve repair conduits and vascularized tissue grafts for nerve repair as well as musculoskeletal repair to support rehabilitation of injured service members. Research efforts have optimized the collagen ink composition and photo crosslinking techniques for 3D printing (3DP) of collagen hollow conduits. Initial cell viability experiments and biomechanical testing for ruthenium cross-linked conduits were performed. This line of work has resulted in multiple publication submissions. Results were accepted for presentation at AMSUS, MHSRS, and TERMIS.

4. **Healthcare Utilization Among Military Health System Beneficiaries Experiencing Amputation Between 2001 and 2017** (Knowledge Solution)

From 2001 to 2017, approximately 5,950 MHS beneficiaries between the ages of 18 and 65 experienced an amputation. Overall, service members utilized a larger proportion of inpatient (93 vs. 69 percent), PT/OT (94 vs. 56 percent), prosthetics and orthotics (67 vs. 53 percent), emergency (69 vs. 64 percent), and primary care (94 vs. 87 percent) services than retirees/dependents (data not shown, $p < 0.001$). This may be due to the significantly larger proportion of service members impacted by traumatic amputations. This is the first study to highlight the characteristics and healthcare utilization of MHS beneficiaries who experienced all-cause major limb loss. Examination of behavioral health (BH) conditions following amputation found approximately 57 percent of service members had an incident diagnosis for a BH condition in the 12 months post-amputation. Quantifying healthcare utilization, and the characteristics which may influence it, is an important first step in determining resources needed for rehabilitation and optimal functional outcomes.

5. **Biopsychosocial Effect of Service Dog Training on Post-Traumatic Stress (PTS) and Post-Concussive Symptoms** (Knowledge Solution)

This was a prospective, longitudinal pre-post study, with weekly assessments for four weeks prior to intervention and six weeks during the service dog training program intervention. Thus far, the impact of the intervention on PTSD and anxiety symptoms, as measured with the PCL-5 and GAD-7, have been analyzed. Following the first intervention week, there was an immediate 2.09 (95 percent CI: -3.63,-0.54) point reduction in PCL-5 scores compared from the baseline period. During the intervention period, with every increase in the intervention week, there was a 0.81 (95 percent CI: -1.23,-0.39) point decrease in the PCL-5 score. Similarly, trends for generalized anxiety were significant in the intervention period. Per every increase in intervention week, odds of anxiety decreased 24 percent (OR: 0.76; 95 percent CI: 0.65,0.90). These results demonstrate improvement in psychological health symptoms following SDTP intervention.



CENTER FOR THE STUDY OF TRAUMATIC STRESS



DIRECTOR: ROBERT URSANO, M.D., COL, MC, USAF (RET)

MISSION

The Center for the Study of Traumatic Stress (CSTS) is committed to advancing trauma-informed care and dedicated to furthering the nation's understanding of the impact of trauma on individuals, families, and communities.

- Consultation and Leadership: CSTS provides national and global leadership to mitigate the effects of trauma exposure and build resilience.

OVERVIEW

As an integral part of USU, the activities of CSTS support the USU Strategic Framework and the mission of the Department of Defense (DoD). The Center is part of our nation's federal medical school at USU and its mission is aligned with the needs of the DoD and the nation. The Center is well-positioned to rapidly respond to DoD mission-relevant activities. CSTS is embedded in the Department of Psychiatry and directly supports USU School of Medicine goals in the following activities:

- Education and Training: CSTS trains USU medical students, MPH students, psychology graduate students, and NP trainees.
- Research and Scholarship: CSTS supports the MHS through a broad research portfolio in four core areas: 1.) service members; 2.) children and families; 3.) neuroscience and neurobiology; and 4.) disasters and terrorism.

The Center's work includes a broad range of trauma exposures: combat, terrorism, natural and human-made disasters, public health threats, and humanitarian operations. CSTS has been involved in nearly every major disaster our nation has experienced in the past 35 years. The Center studies military and civilian disasters, using lessons learned in each community to inform the other, and helps to ensure that behavioral health is addressed in the face of public health threats, disaster planning, and disaster recovery. Mitigating the effects of disaster and trauma in military and civilian populations is part of the effort to foster community and national resilience. CSTS informs and educates community, regional, state, national, and global stakeholders in government, industry, healthcare, public health, and academia. The Center contributes to advancing trauma-informed care by providing leadership in research, education, training, consultation, and global health.

TOP **CSTS** DELIVERABLES

1. **Study to Assess Risk and Resilience in Servicemembers – Longitudinal Study (STARRS-LS)** (Materiel and Knowledge Solution)

The Army STARRS study is the largest ever conducted on military suicide. Results and recommendations actively shape DoD and civilian mental healthcare for suicide and related risk factors. The study has resulted in more than 115 published articles and more than 100 recommendations. It was also the first use of machine learning in the DoD to identify soldiers at risk of suicide.

2. **War in Ukraine Support** (Materiel and Knowledge Solution)

CSTS was sought out by global colleagues and stakeholders within Ukraine and around the world to provide consultation, develop and support educational seminars and learning series, and disseminate actionable just-in-time resources to protect mental health and foster resilience among military and civilian populations affected by the war.

3. **Suicide Prevention Program** (Materiel and Knowledge Solution)

Informed by the Army STARRS family of studies, the Center established the Suicide Prevention Program (SPP) to develop action-oriented and evidence-based products and programs to address suicide and related risk behaviors. SPP projects focus on populations with unique risk factors through a range of interagency and private sector partnerships.

4. **The Veterans Affairs (VA) National PTSD Brain Bank.** (Materiel and Knowledge Solution)

In partnership with the VA's National Center for PTSD and co-founded by CSTS scientists, "Brain Bank" is the first human tissue biorepository dedicated to examining the impact of trauma and stress on human body tissues with the objectives of identifying biomarkers of susceptibility and resilience to trauma and assisting in targeting new treatments.

5. **16th Annual Amygdala, Stress, and PTSD Conference: Cells, Circuits, Sensors, and Stress** (Knowledge Solution)

CNRM has three clinical trials that are conducted 100 percent virtually by mail, telephone, and secure internet. These trials use app-based digital therapeutics to deliver evidence-based therapeutic interventions for TBI-related insomnia, depression, and headaches. CNRM innovated two of these applications and collaborated with the University of Virginia to modify an existing application, making it more reflective of experiences within the warfighter community. Compared to traditional, in-person clinical trials, studies involving digital therapeutics can be deployed on a much larger scale to a broader participant base at a lower cost. These trials are amenable to warfighters with dispersed geographical locations and unique schedules. With CNRM's virtual trials, participants have the opportunity to participate in groundbreaking TBI research via a tablet or smart device from any location throughout CONUS.

Center for the Study of Traumatic Stress

Helping others Calm an Acute Stress Response (Horror, Fear, Agitation)

NEAR

Stand or sit near them and say: "Look at me. Can you hear me?"

CONNECT

"I'm going to squeeze your arm, you squeeze me back."

"Look in my eyes. See me here."

"I'm right here with you, I'm not going anywhere. You are not alone."

"Talk with me — what are you thinking? I am here with you."

CALM

"Take deep breaths. Keep your eyes open."

"Tap your finger slowly on your leg or arm — feel the tapping? Tap slowly, count with me."

PRESENT

"Hold my hand. We are ok. We will work to stay ok."



www.CSTSONline.org

CONSORTIUM FOR HEALTH AND MILITARY PERFORMANCE



DIRECTOR: PATRICIA DEUSTER, PH.D., MPH, FACSM

MISSION

Enhance warfighter performance and readiness through evidence-based Human Performance Optimization knowledge, guidance, and operational support.

VISION

To be the premier Department of Defense (DoD) readiness resource for Human Performance Optimization across the Total Force Fitness domains in support of DoD operations. As it continues to evolve, Consortium for Health and Military Performance (CHAMP) will strive to expand HPO collaborations with federal partners.

OVERVIEW

Established in 2006, CHAMP is a DoD Center of Excellence within the Department of Military Emergency Medicine at USU. CHAMP serves the U.S. Armed Forces through education, training, research, scholarship, leadership, service, and operational support in two areas:

- Human Performance Optimization (HPO) – The process of applying knowledge, skills, and emerging technologies to improve and preserve the ability of warfighters to execute mission-essential tasks through enhancement, sustainment, and restoration.
- Total Force Fitness (TFF) – A holistic framework for building and maintaining the optimal health, readiness, and performance of warfighters by using the interconnections and intersections across mind, body, spirit, and social relationships. TFF acknowledges the importance and contributions of military families, communities, and culture in the execution of mission-essential tasks and operational readiness.

CHAMP's expert team of scientists, providers, and educators collaborates with operational, medical, and military research communities, as well as other federal agencies and academic institutions, to advance knowledge products and technologies in HPO and TFF. The Center delivers innovative resources for warfighters and their families, military healthcare providers, and the military community as a whole.

TOP CHAMP DELIVERABLES

1. Total Force Fitness (TFF) to Whole Health Summit (Knowledge Solution)

CHAMP partnered with the Veterans Affairs (VA) Veterans Health Administration (VHA) Office of Patient Centered Care and Cultural Transformation (OPCC&CT) to host the Total Force Fitness to Whole Health (TFF-WH) Summit. The goal was to promote a shared mission of optimizing the health and well-being of service members and veterans. More than 300 participants attended the two-day event. Key outcomes included: confirming Executive Leadership commitments from the DoD and VA to collaborate on TFF-WH; establishing a formal collaboration between the DoD and TFF-WH; developing a DoD-VA team to lead the collaboration; and establishing cross-agency metrics to measure the success of the collaboration.

2. Military Health and Performance Optimization – Integrator Basic Course (MHPO-I) (Knowledge Solution)

The Human Performance Resources by CHAMP (HPRC) team delivered the first iteration of the MHPO-I Basic Course at the National Guard Professional Education Center (PEC) in Little Rock, Arkansas. Across four days, 70 National Guard members learned about critical TFF domains (mental, physical, nutritional, spiritual, and sleep readiness), as well as how to be an Integrator within their units.

3. DoDI 6130.06: Use of Dietary Supplements in the DoD (Knowledge Solution)

The Department of Defense Instruction (DoDI) 6130.06: Use of Dietary Supplements in the DoD was issued and established CHAMP’s Operation Supplement Safety (OPSS) as the official DoD dietary supplements program. The DoD also states that OPSS will maintain and host the official DoD Prohibited Dietary Supplement Ingredient List and provide educational training on dietary supplements for all service members and health-related service providers. The OPSS team is developing a Health Professional Training Module for this requirement. The DoDI also mandates that healthcare providers report adverse events associated with the use of dietary supplements.

4. Technology Enhanced Mobile Platform for Performance Optimization (TEMPPPO) (Knowledge Solution)

The CHAMP evaluation team launched TEMPPPO, a web-based mobile app. TEMPPPO is a virtual coach for optimizing fitness and readiness. It provides an initial fitness assessment, suggests customized fitness content, and provides a three-level workout program. TEMPPPO supports service members in their efforts to achieve optimal performance across all TFF domains. Pilot sites in Georgia, Kansas, Minnesota, New Mexico, and Washington consist of Army National Guard members wanting a higher level of fitness and mission readiness.

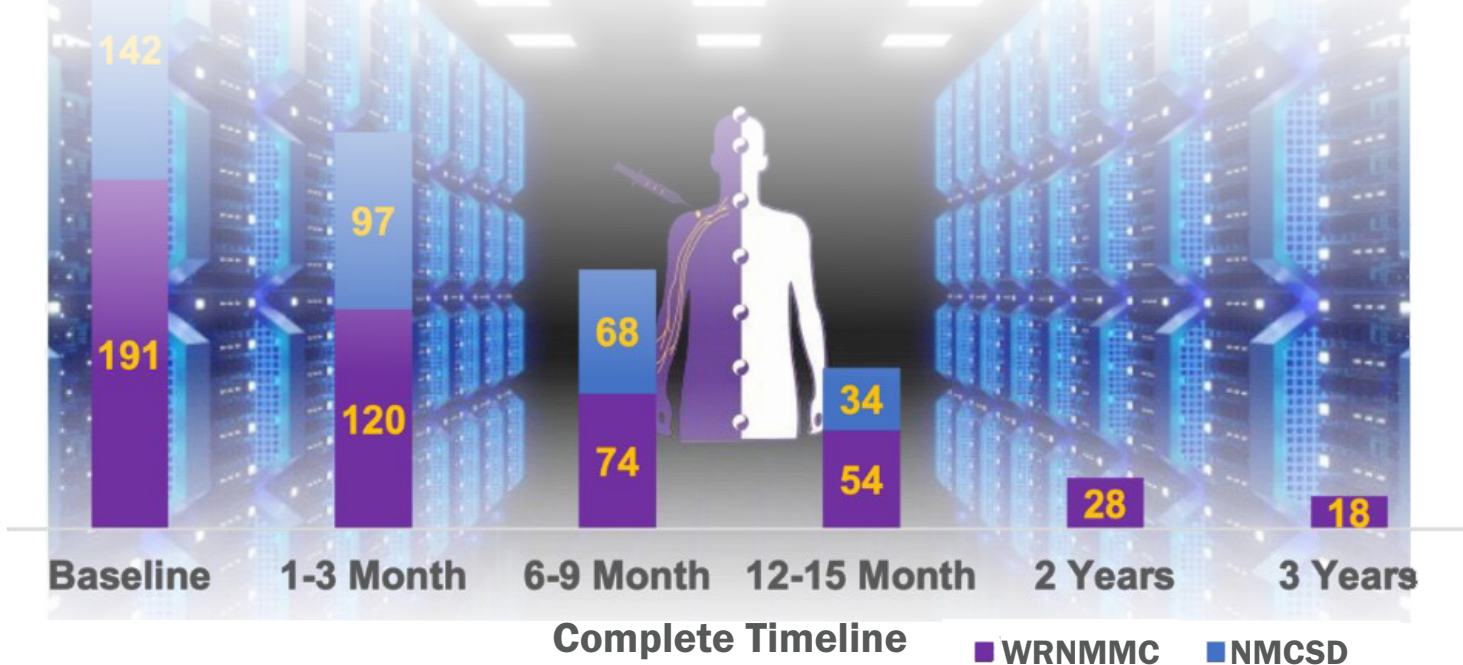
5. HPO Presentations and Products for Military, Federal, and DoD-affiliated Audiences (Knowledge Solution)

CHAMP completed 140 educational speaking engagements and made more than 50 research presentations at academic conferences and to specialized military units and communities. CHAMP also provided educational materials to over 90 locations worldwide.

The U.S. Army Family Morale, Welfare, & Recreation (MWR) program office requested the HPRC team create a pre-activity algorithm to display in their recreational facilities. Feedback indicated that a 13 percent improvement on their FIT 1 Pre-Activity Screening was directly a result of the pre-activity screening tool that HPRC produced. HPRC also provided similar posters for other services. CHAMP is answering the call for military-relevant and science-based educational resources and materials.



DEFENSE AND VETERANS CENTER FOR INTEGRATIVE PAIN MANAGEMENT



(Timeline above shows the number and duration of studies at two sites where DVCIPM conducts research.)

DIRECTOR: HAROLD GELFAND, M.D., CAPT, MC, USN

MISSION

The Defense and Veterans Center for Integrative Pain Management (DVCIPM) leverages the best available evidence, clinical expertise, and collaboration to develop and communicate recommendations in support of DoD pain management practice, education, and research. DVCIPM’s work also addresses the wide scope of operational anesthesiology and pain management related to the consequences of combat operations as well as acute and chronic conditions caused by or exacerbated by military service.

VISION

DVCIPM serves as the unifying force for military pain management excellence and standardization.

OVERVIEW

DVCIPM is the DoD’s designated Center of Excellence for pain management. DVCIPM maintains an organizational emphasis on continuous outreach and collaboration with the respective pain management leadership (clinical and organizational) and designees from the DHA, uniformed services, Veterans Health Administration (VHA), and federal and civilian medicine to support three lines of effort:

- Clinical Pain Medicine – Coordinate the DoD translation of the evidence-based research information on pain management into actionable and sustainable recommendations that optimize delivery of acute and chronic pain management across the clinical continuum for service personnel and their families. This includes from point of injury to recovery, whether on the battlefield or at home, and improving readiness of the force while also improving efficiency of care delivery.
- Pain Education and Training – Serve as a proactive resource and clinical subject matter expert for USU, Defense Health Agency (DHA), uniformed services, and other DoD agencies. In addition, strategically communicate with them (using the web and other media) on emerging pain management issues that impact readiness, retention, and health of military personnel and their families (e.g., abuse/overuse/diversion of pain medications, unwarranted variation in pain management practice, policy and education, and other relevant areas).
- Pain Research – Conduct, collaborate, and coordinate basic, clinical, and translational research in the field of pain management through collaboration with USU, the Institute for Surgical Research (ISR), uniformed service pain management providers, other DoD agencies, VHA, academia, industry, and others that share the common goal of providing multidisciplinary and multi-modal pain management focused on improving quality of life and function.

TOP *DVCIPM* DELIVERABLES

1. Evidence in the Learning Organization Model (Knowledge Solution)

As part of the formulation steps of the Evidence in the Learning Organization model, DVCIPM identified common surgeries, performed multilevel modeling to evaluate predictors of opioid prescribing at post-surgical discharge, and constructed data visualizations that can be transformed into data dashboards to support practice improvement. Some of these constructed visualizations include health-equity dashboards, which are consistent with the tenants and recommendations outlined by the WHO regarding health equity monitoring practices. For example, DVCIPM studies found significant variation in vasectomy, C-section, total knee and hip arthroplasty, hysterectomy, cholecystectomy, and appendectomy prescribing practices. As such, the next phase of this model posits that it will be necessary to conduct implementation and practice change research to reduce excessive opioid prescribing across MTFs and providers.

2. Improved Translation of Pain Management Evidence/Clinical Guidelines into Clinical Practice (Knowledge and Materiel Solution)

As the DoD's designated Center of Excellence for pain management, one of DVCIPM's aims is to ensure that emerging medical evidence and clinical practice guidance is rapidly translated into DoD policies and clinical support tools. In 2022, the CDC published revisions to their Opioid Prescribing Guidelines and DoD/VA revised the Clinical Practice Guideline for the Management of Opioid Therapy for Chronic Pain. DVCIPM, in collaboration with DHA Pain Management Clinical Support Service, conducted a review of these updated guidelines and developed recommendations for revisions to the DHA policy for pain management and opioid safety (DHA-AI 6025.08). DVCIPM also completed necessary revisions to DHA's Informed Consent for Long-Term Opioid (DHA Form 105) and provided recommendations on opioid prescribing alerts that were fielded into MHS Genesis.

3. National Capital Consortium (NCC) Regional Anesthesia and Acute Pain Medicine (RAAPM) Fellowship (Knowledge Solution)

The National Capital Consortium (NCC) Regional Anesthesia and Acute Pain Medicine (RAAPM) fellowship of USU, established by DVCIPM in 2004, was among the first such fellowship programs in the world dedicated to teaching advanced acute pain management techniques and is the only such fellowship program in the DoD. Throughout the evolution and development of this subspecialty, DVCIPM has maintained a central role in creating the national standards, policies, and requirements governing the fellowship. DVCIPM was instrumental in the Accreditation Council for Graduate Medical Education's decision to formally accredit RAAPM as a subspecialty of anesthesiology in 2017. The NCC RAAPM fellowship received its accreditation in 2019 and is among the most popular anesthesiology subspecialty programs in the MHS, having certified 19 fellows since its inception. The program is located at Walter Reed National Military Medical Center (WRNMMC) with additional clinical rotations conducted at other MHS and civilian facilities.

4. Pain Registry Biobank (Materiel Solution)

The Pain Registry Biobank is an IRB-approved registry collecting a robust set of patient-reported outcomes, medical history data, and blood and saliva samples from participants at the Walter Reed National Military Medical Center and Naval Medical Center San Diego. The broad inclusion criteria and the longitudinal data and sample collection offer an unmatched resource for researchers interested in the biopsychosocial characteristics of pain. The Biobank is in its fourth year of enrollment and follow-ups, and some of the first participants have provided more than three years of data and periodic blood samples. Currently there are 343 participants enrolled, 800 blood draws completed, and 17,000 specimens stored for subsequent biomarker, proteomics, and genomics studies.

5. Evaluation of DoD Patient Utilization of VA Virtual Functional Restoration Program (Knowledge Solution)

DVCIPM serves as the DoD lead on the DoD/VA Health Executive Committee's (HEC) Pain Management Work Group (PMWG). The HEC PMWG focuses on improving collaboration and synchronization of DoD and VA pain management education, clinical care, and research initiatives. Under the auspices of the HEC PMWG, DVCIPM developed a two-year project to evaluate outcomes and satisfaction from DoD patient completion of the virtual functional restoration "PEAK" program (FRP) conducted by the Tampa VA Hospital. The project was developed as a response to the severe limitations on face-to-face healthcare during COVID and the need to provide access to FRP-services to service members with chronic pain conditions who are located in remote locations. This project also serves as another opportunity to expand DoD/VA utilization of common education materials and clinical practices, thus improving transition of care for those service members who receive care in VA facilities following separation from the military.



DIRECTOR: FREDERICK C. LOUGH, M.D., FACS, COL, MC, USA, (RET)

MISSION

The mission of the DoD Medical Ethics Center (DMEC) is to serve as the national and international lead in military medical ethics for all healthcare providers in the Military Health System (MHS) and the Department of Defense (DoD), as outlined in DoDI 6025.27, Section 2.3(a). In addition and internal to USU, DMEC will coordinate its tasks in military medical ethics with USU's military medical leadership and professional development curriculum and programs to ensure that USU students become ethical practitioners and leaders at all levels in the nation's uniformed health services.

VISION

DMEC will assist in the development and implementation of the DoD Medical Ethics Program (DoDMEP) and will develop a plan for MRS-wide medical ethics training, as per Sections 2.2 and 4.3 of DoDI 6025.27. Moreover, DMEC will develop and maintain a DoD Health Care Ethics Portal as a centralized resource for medical ethics and will be capable of receiving inquiries and requests for medical ethics

consultation. The portal will also provide access to relevant policies, guidance, and laws; sources of education and training; and pertinent codes of ethics. Internally within USU schools, DMEC will coordinate closely with programs for professional military medical leadership development in order to train and develop a new generation of military medical leaders and professionals solidly grounded in the highest standards of medical ethics.

OVERVIEW

DMEC is a responsive thought and advisory Center focused on the following current initiatives: 1.) Broadcasting across a Bioethics Training Course to standardize the military medical ethics curriculum across the MHS; 2.) Deploying a mobile application to house the curriculum of the Bioethics Training Course to reach a broader audience across the MHS; and 3.) Continuously improving DMEC and its bioethics consultancy processes to ensure real world advisory counsel can be provided in a timely manner in both the research and clinical environments.

TOP **DMEC** DELIVERABLES

1. **DMEC Bioethics Consultancy Responses** (Knowledge Product)

To date since operational capability on January 1, 2019, DMEC has successfully responded to 103 separate bioethics consultancy requests from MHS healthcare professionals in both clinical and research environments, including numerous and diverse inquiries throughout 2022. In practice, DMEC is providing standardization to the challenging field of medical ethics in all the worldwide locations where the DoD has healthcare workers, which includes more than 70,000 practitioners. Prior to DMEC, addressing medical ethics issues facing healthcare workers was localized and fragmented. No system-wide effort existed to benefit from previous experiences. DMEC provides real-time assistance to both the existing medical ethics committees throughout the MHS, as well as to individual healthcare practitioners.

2. **DMEC Instruction to USU School of Medicine Students in Military Medical Ethics** (Knowledge Product)

DMEC assisted the USU School of Medicine Department of Military and Emergency Medicine (MEM) in July and August 2022 in helping to provide three iterations of an operationally focused military medical ethics course to rising second year medical students in coordination with the MEM leadership principals, the USU Chaplain, and invited guest lecturers. The training evolution harvested recent and real-time knowledge of U.S. military medical providers present during the highly chaotic U.S. extraction from Afghanistan, as well as focusing on possible future military medical ethics challenges in more of a symmetrical warfare context.

3. **DMEC/KLC Collaboration on Military Medical Ethics** (Knowledge Product)

DMEC is currently collaborating with the Centre for Military Ethics at King's College London (KCL) (www.militaryethics.uk/en/) in order to create numerous academic training products focused on military medical ethics issues that might be encountered in a possible future symmetrical warfare conflict in light of the current Russian hostilities in Ukraine, as well as rising U.S. tensions with both China and North Korea in the Pacific theater. The KCL effort is being led by Lieutenant General Martin Bricknell, who served 34 years in the UK Defence Medical Services, culminating in his service as the Surgeon General of the entire UK Armed Forces (www.kcl.ac.uk/people/professor-martin-bricknell).


4. **DMEC Bioethics Training Course** (Knowledge Product)


DMEC has created a Bioethics Training Course designed to elevate the foundational knowledge of the personnel assigned to the medical ethics committees across the MHS (<https://www.youtube.com/watch?v=yIvEya73e-IE&list=PLr4mqJimffIKo8hxyqPX5JNe472mn0Ntg>). The Bioethics Training Course addresses general bioethics principles, best practices for ethics consultation requests, and unique challenges within the military medical ethics domain. The Bioethics Training Course will ideally be run on an annual basis, as a train-the-trainer model for further dissemination of the subject information. The initial offering of the Bioethics Training Course will be structured as a remote/virtual event, due to current pandemic restrictions. Eventually the Bioethics Training Course will evolve into a hybrid model, with both live attendance at USU and remote learners. The Bioethics Training Course curriculum materials are also contained in the DMEC Bioethics Mobile Application (as discussed below) in order to disseminate the knowledge to as broad an audience as possible. The DMEC Bioethics Training Course is now available on the DMEC website (<https://www.usuhs.edu/research/centers/dmec>) and at the direct video playlist link above.

5. **DMEC Bioethics Mobile Application** (Knowledge Product)

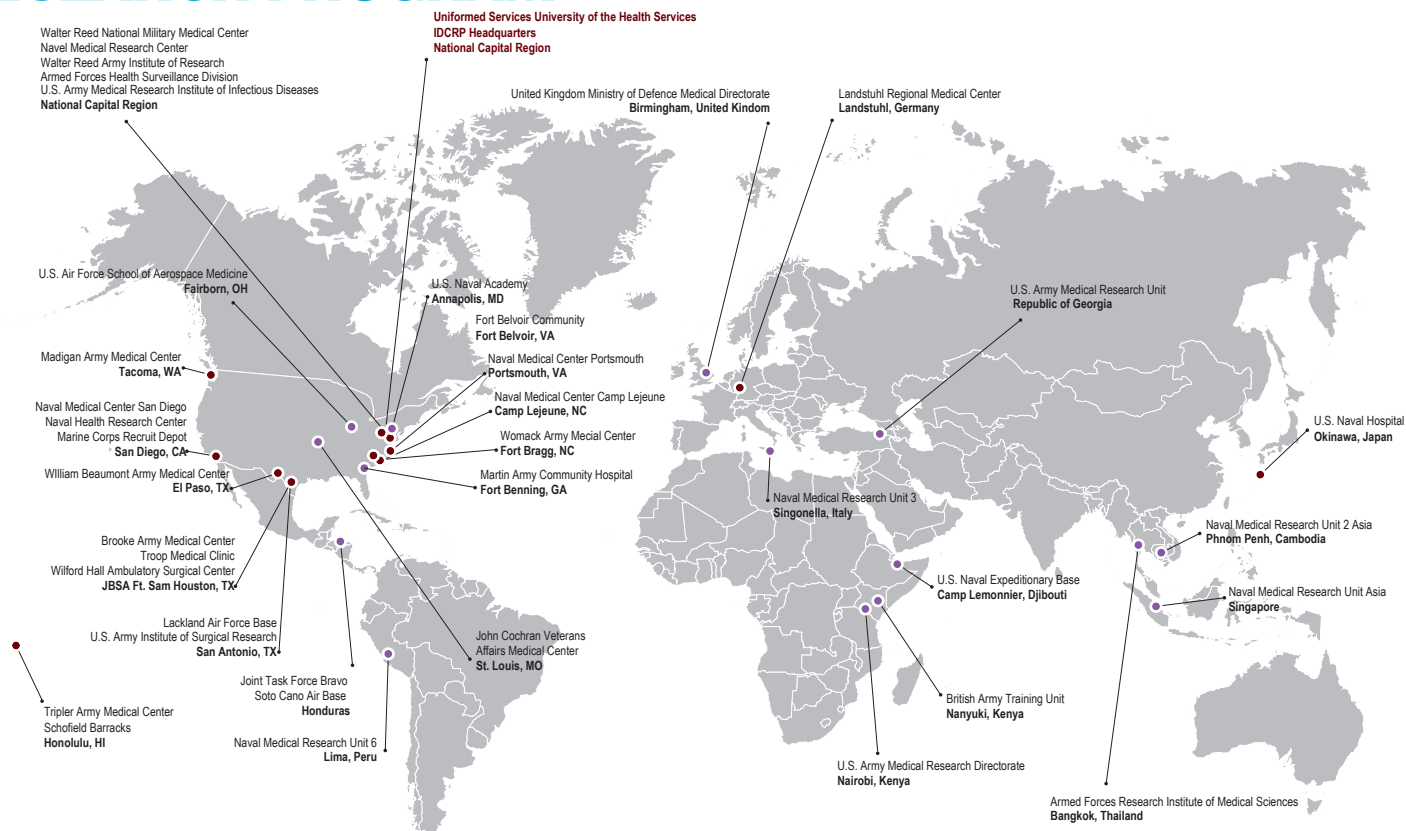
DMEC is extremely excited to announce the launch of its Bioethics Mobile Application through a fantastic partnership with Quick Series (<https://www.quick-series.com/>). The DMEC Bioethics Mobile Application Introductory Video is listed for reference (inset right). In addition, the DMEC Bioethics Mobile Application itself can be downloaded free of charge on a smartphone via the normal App Store protocols at the platform links.

 **DoD Medical Ethics Center (DMEC) Bioethics Mobile Application Introductory Video:**
<https://youtu.be/pUJKbxedJIY>

 **Google Play Store:**
<https://play.google.com/store/apps/details?id=com.quickseries.rca.dmec>

 **Apple App Store:**
<https://apps.apple.com/us/app/defense-medical-ethics/id1635965168>

INFECTIOUS DISEASE CLINICAL RESEARCH PROGRAM



DIRECTOR: ROBERT O'CONNELL, M.D., FACP; COL, MC, USA

MISSION

To conduct multicenter infectious diseases clinical research, focusing on high-impact cohort and interventional trials, to inform and improve care of the warfighter.

VISION

To substantially reduce the impact of infectious diseases in the military population through collaborative clinical research.

OVERVIEW

The Infectious Disease Clinical Research Program (IDCRP) is a DoD-chartered research center headquartered at USU. The Program's primary aim is to design, execute, and disseminate the findings from clinical research initiatives that address prioritized infectious disease knowledge gaps to advance clinical practice and inform military health policy. In collaboration with partners from the DoD, academia, government, and industry, IDCRP supports a broad clinical research portfolio within the Military Health System to include observational, longitudinal cohort studies, field-based interventional trials, and evaluation of long-term health outcomes. The findings from this research have

far-reaching implications for public health beyond military communities.

The expertise of IDCRP staff members includes infectious diseases, epidemiology, preventive medicine, public health, microbiology, data programming, statistical analysis, finance, program management, and regulatory affairs. Staff members are distributed within DoD medical treatment facilities, USU, and operational clinics within the United States as well as overseas.

All research within IDCRP is focused on clinical questions associated with militarily important infectious disease risks. Infectious disease may impact training and readiness at the individual or unit level and nearly always has significant impact on the nonmilitary populations as well.

IDCRP strives to provide evidence-based information and analysis that can inform DoD force health protection policy and/or facilitate further research questions. Key research areas include: acute respiratory infections and COVID-19; deployment and travel-related infections; human immunodeficiency virus and sexually transmitted infections; and wound infections.

TOP **IDCRP** DELIVERABLES

1. Launch of Two Travelers' Diarrhea (TD) Studies to Define DoD Strategy to Counter the Impacts of Acute Watery Diarrhea Among Deployed Military Forces (Knowledge Solution)

TrEAT TD 2.0 is a randomized, double-blinded placebo-controlled trial designed to improve clinical practice guidelines for effective treatment of TD in deployed settings, while P2 is a double-blinded placebo-controlled trial that aims to determine the efficacy of the over-the-counter product Travelan to prevent TD and downstream health impacts. The studies involve collaboration with DoD MTFs (TAMC, NMCP/NMCCCL, MAMC), OCONUS partners (NAMRU-3 in Djibouti, NAMRU-6 in Honduras), the Defense POW/MIA Accounting Agency, and UK forces in Kenya.

2. Pragmatic Assessment of Influenza Vaccine Effectiveness in the DoD (PAIVED), Partnership with National Institute of Allergy and Infectious Diseases (NIAID) and Six DoD Sites, Completes Final Fourth Season (Knowledge Solution)

PAIVED seeks to identify distinctions in effectiveness and immune responses between currently available FDA-licensed influenza vaccine formulations (egg-derived, cell-culture-derived, and recombinant licensed) in 15,552 volunteers across four seasons of observation.

3. IDCRP Sites for the Meningococcal (Bexsero®) Vaccine for Gonococcal Infection Led Overall Enrollment Among Collaborating NIAID Partners (Knowledge and Materiel Solution)

This Phase II randomized, placebo-controlled, observer-blinded clinical trial evaluates the efficacy of the Bexsero® meningococcal vaccine for protection against gonorrhoea infection, a common infection among service members. The trial is a collaboration between USU, the Walter Reed National Military Medical Center, the Walter Reed Army Institute of Research, and its partnering sites (Royal Thai Army, Thailand Red Cross), the University of Alabama Birmingham, and GlaxoSmithKline. The sites at WRNMMC and in Thailand have enrolled >700 participants, which is 75 percent of total enrollees.

4. Epidemiology, Immunology, and Clinical Characteristics of Emerging Infectious Diseases with Pandemic Potential (EPICC) Delivers Key Insights into Clinical Outcomes Associated with New SARS-CoV-2 Variants and Risk Factors for “Long COVID” (Knowledge Solution)

This prospective cohort study of SARS-CoV-2 infections in active-duty service members and DoD beneficiaries informs development of diagnostic, treatment, and preventive strategies. Findings published in JAMA Network Open “Persistent COVID-19 symptoms at six months post-onset and the role of vaccination before or after SARS-CoV-2 infection” describe the incidence and risk factors of post-COVID-19 condition (PCC). Vaccination before or after acute COVID-19 illness was associated with a lower risk of PCC symptoms and medical encounters. EPICC data have been presented twice at the USFDA Vaccines and Related Biological Products Advisory Committee to inform the use of COVID-19 vaccines and boosters.

5. The Trauma Infectious Diseases Outcomes (TIDOS) Study Publishes a 2022 Supplement of Military Medicine (Knowledge Solution)

The TIDOS supplement reported over a decade of IDCRP combat trauma-related research, highlighting the history and clinical relevance of TIDOS and DoD JTS CPG development support, as well as clinical findings from research on extremity wound infections, invasive fungal infections, wound microbiology, and long-term outcomes.

JOHN P. MURTHA CANCER CENTER RESEARCH PROGRAM



DIRECTOR: CRAIG SHRIVER, M.D., COL, MC, USA (RET)

MISSION

Improve the diagnosis and multidisciplinary treatment of DoD cancer patients through innovative clinical research, care, and education. Through coordination and alignment with tri-service cancer research initiatives throughout the Military Health System (MHS), the John P. Murtha Cancer Center Research Program (MCCRP) enhances the readiness of the military, its families, and beneficiaries. MCCRP employs the unique resources of the DoD leveraged with other federal and civilian partners to enhance cancer care for service members and DoD beneficiaries.

VISION

As the only DoD-designated cancer Center of Excellence, MCCRP is the nexus of cancer services and support for the MHS with clinical and translational research cancer programs fully integrated with USU, NCI, and VA.

OVERVIEW

MCCRP was established originally at USU as the United States Military Cancer Institute (USMCI) in 2002, becoming the John P. Murtha Cancer Center (MCC) in 2012 with the completion of the 2005 Base Realignment and Closure (BRAC) process. On May 22, 2012, MCC was designated as the DoD's only Center of Excellence for cancer care by the Assistant Secretary of Defense (Health Affairs) (ASD (HA))

Military Health System (MHS) Centers of Excellence Oversight Board. MCC is a cancer research and treatment center at Walter Reed National Military Medical Center (WRNMMC). MCCRP integrates USU with MCC to provide robust tri-service clinical cancer research integrated within National Capital Region and throughout the MHS in three multidisciplinary translational cancer research programs: Center for Prostate Disease Research (CPDR), GYN Center of Excellence (GYN CoE) and the Clinical Breast Cancer Project (CBCP). MCCRP focuses on research designed to address cancer prevention, screening, treatment, rehabilitation, and survivorship of service members, beneficiaries, and veterans who suffer from cancer, including translating research and development into novel and innovative treatment and rehabilitation options. As indicated by the ASD (HA) Initial Capabilities Document 2017 resulting from the Cancer Care Capabilities-Based Assessment, the ultimate MCC goal for the MHS is that cancer is prevented, screened for, detected, treated, cured, and rehabilitated, or impacts of cancer and cancer treatment are mitigated so service members are returned to duty, reclassified to a new duty position, or reintegrated into civilian/VA life with highest possible quality of life. MCCRP's cancer educational and clinical research capabilities are designed to enable the MHS to effectively and efficiently support a medically ready force and provide world-class cancer services for the MHS.

TOP **MCCRP** DELIVERABLES

1. Murtha Cancer Center 10th Anniversary and Proclamation of Collaborations and Scientific Advances (Knowledge Product Solution)

MCCRP celebrated the 10th anniversary of the inception and naming of the John P. Murtha Cancer Center at WRNMMC and the Murtha Cancer Center Research Program of USU. The Center was recognized as DoD's only Center of Excellence for cancer care and research. USU President Jonathan Woodson delivered remarks and Steven Lieberman, M.D., Deputy Under Secretary for Health, VA; Seileen Mullen, Acting, Assistant ASD(HA); and Douglas Lowy, M.D., Principal Deputy Director, NCI signed an inter-agency proclamation.

2. PROMETHEUS (PROject for Military and Toxin History Evaluation in U.S. service members) Arose Out of President Biden's White House Cancer Moonshot 2022 initiative as a Cancer Moonshot 2.0 Project of USU MCCRP (Knowledge and Materiel Solution)

The goal of PROMETHEUS is to discover advanced precision oncology technologies that will enable prevention, early detection, and enhanced treatments of cancers arising from exposures to toxins and environmental contaminants. This will enable military service members to return to duty, reclassify to a new duty position, or reintegrate into civilian life with the highest possible quality of life.

3. MCCRP Clinical Breast Care Program Found that MHS Breast Cancer Patients Exhibited a 24 Percent Lower Risk of Death than the General Population Cancer Patients and Active-Duty Women had a 41 Percent Lower Risk of Death than Their Civilian Counterparts (Knowledge Product)

Breast cancer is the most common cancer among military service women and results in decreased force readiness. In the U.S. general population, barriers to healthcare access leads to suboptimal treatment and poor survival. The study found that active-duty women had a 41 percent lower risk of death than their civilian counterparts.

4. Gene Mutation from African Ancestry in Prostate Cancer Discovered (Knowledge and Materiel Solution)

The Center for Prostate Disease Research (CPDR) established a protocol to identify African ancestry gene mutations as possible contributors to the high incidence and mortality of prostate cancer among African American men. Prostate cancer is the third highest cause of cancer in active duty personnel. Patients of African ancestry frequently inherit gene mutations of the "RAD" gene that are potential targets for therapy with PARP inhibitors.

5. GYN-Center of Excellence-Directed Proteogenomic Analysis of High Grade Serous Ovarian Cancer (HGSOC) Tissues has Led to the Identification and Validation of a Novel Expression Signature. (Knowledge and Materiel Solution)

This signature may improve the identification of HGSOC patients with homologous recombination deficiency HRD disease for treatment with targeted poly ADP ribose polymerase (PARP) inhibitors. A provisional patient application describing this discovery has been filed. HRD arises from mutations in DNA damage response (DDR) genes, e.g., breast cancer type 1/2 susceptibility protein (BRCA1 or BRCA2) that regulate homologous recombination DNA repair. Measurement of HRD correlated protein and transcript alterations in tumors collected at primary or interval debulking surgeries as well as during pre-diagnostic laparotomy can function as a companion clinical diagnostic assay to identify patients who will benefit from treatment with PARP inhibitors. Intellectual property protection has been filed for this discovery.

NATIONAL CENTER FOR DISASTER MEDICINE AND PUBLIC HEALTH



DIRECTOR: THOMAS KIRSCH, M.D., MPH

MISSION

The mission of the National Center for Disaster Medicine and Public Health (NCDMPH) is to improve the United States disaster health readiness through advancements and improvements in education, research, practice, and policy.

VISION

NCDMPH will be the U.S. academic Center of Excellence leading disaster health education and research. In collaboration with our federal partners, we will facilitate science and education to inform policy, operations, and funding decisions that improve our readiness, save lives, and mitigate injuries in disasters.



OVERVIEW

NCDMPH was founded in 2007 under five federal agency partners: The Department of Health and Human Services, Department of Defense, Department of Homeland Security, Department of Transportation, and Department of Veterans Affairs. The Center is uniquely positioned as a bridge between federal agencies and academia that works with military, nonprofit, private, and federal collaborators to advance the mission. NCDMPH serves in the following roles:

- Leads and collaborates with strategic partners within the government, private sector, community, and non-profit sectors to advance disaster medicine and public health education and research agendas.
- Serves as a neutral coordinator across: federal, state, tribal, and local governments; non-government associations and organizations; and academia.
- Convenes experts from diverse backgrounds to define disaster health issues and recommend policy solutions.
- Provides expert consultation to all strategic partners regarding disaster health education, training, and science.

TOP **NCDMPH** DELIVERABLES

1. **DoD National Defense Medical System (NDMS) Pilot Program Year-1** (Knowledge Solution)

The congressionally directed NDMS Pilot program (Pilot) continued its five-year mission to improve the readiness of the U.S. healthcare system in the event of a catastrophic conflict or disaster. During 2022, the Pilot team worked directly with federal interagency partners and civilian healthcare organizations to identify the most critical problems and optimum solutions to strengthen NDMS. The team built regional coalitions and plans, executed targeted sub-studies, and provided direct support for NDMS activities at its five sites in Sacramento, San Antonio, Denver, Omaha, and the National Capital Region.

2. **NDMS Pilot Program implementation plans** (Knowledge Solution)

Each of the five Pilot sites developed a detailed site implementation plan that laid out specific activities and changes needed to strengthen healthcare system preparedness in the region. Examples include in site-specific plans include: recruitment of non-hospital facilities to increase bed capacity; clarifying roles and responsibilities between military and civilian partners; and integrating best practices and existing local patient regulating systems into NDMS. From these site implementation plans, a master implementation plan was created, focused on strategic, national-level NDMS opportunities for the DoD and federal interagency partners. This plan aggregated elements of the site-specific plans that have a national scope or can be scaled nationwide, focusing on coordination and collaboration across local, regional, state, and federal partners.

3. **NDMS Pilot Program Literature** (Knowledge Solution)

The Pilot also conducted three sub-studies to elaborate on and further articulate the gaps and opportunities in NDMS: COVID-19 Leading Practices, which focused on capturing the knowledge and experience of how healthcare systems at each of the five sites adapted to the surge of COVID-19 patients during the prior two years and identified many operational changes directly applicable to improving NDMS capabilities and capacities; “NDMS Federal Legislative Landscape Analysis,” which analyzed and identified significant opportunities to strengthen NDMS authorities, policies, and federal coordination; and NDMS Medical Surge Modeling Tool, which quantified the number of available medical surge beds in the NDMS definitive care network and model availability by illness/injury categories, care type, clinical specialty, bed type, and occupancy days.

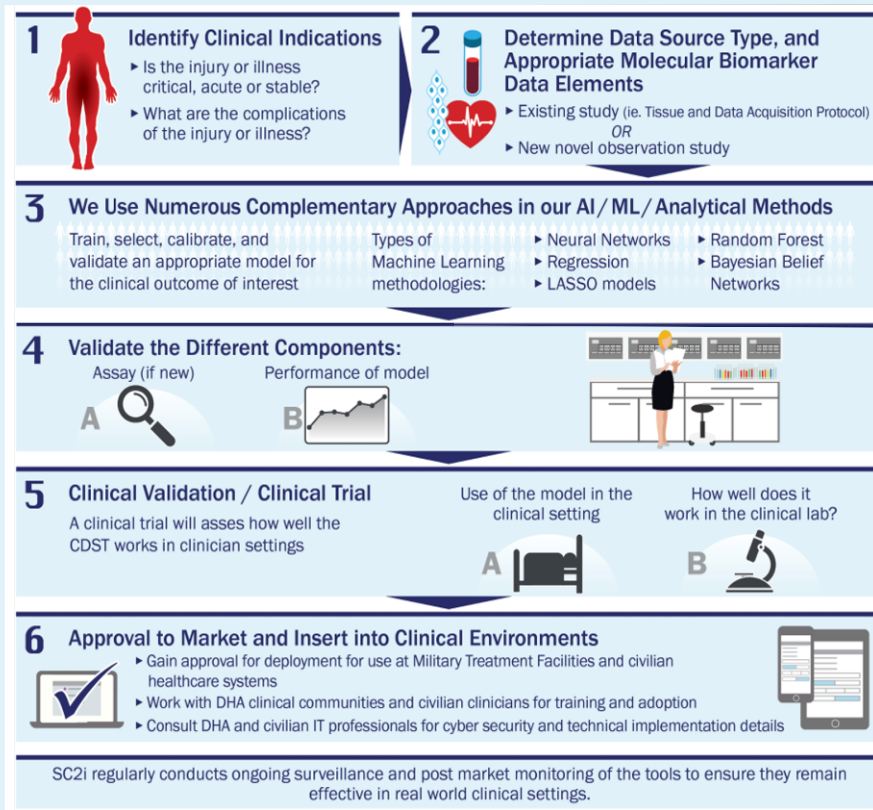
4. **First Aid for Severe Trauma (FAST™)** (Knowledge Solution)

The First Aid for Severe Trauma™ (FAST™) is the first national STOP THE BLEED® course designed specifically for high school students. NCDMPH developed and launched FAST in collaboration with the American Red Cross, with funding from the Department of Homeland Security. FAST teaches the knowledge and skills necessary to save lives in the minutes after a severe injury—before professional help can arrive. FAST™ is now available from the Red Cross in three formats—instructor-led, web-only, and blended—to allow maximum flexibility for students and teachers. From new instructors teaching FAST to students trained in FAST, more than 3,000 individuals across the United States have been exposed to and are engaged with the course.

5. **Stop the Bleed** (Knowledge Solution)

To combat the national health crisis of trauma-related deaths, the White House initiated the Stop the Bleed program in 2015. This initiative trains, equips, and empowers laypersons to stop bleeding in emergencies. NCDMPH worked to further this initiative through education, training, and public engagement. Two key accomplishments include the design and launch of the mobile application with over 2,700 downloads and the Stop the Bleed Education Consortium, which is composed of experts who set standards for bleeding education and published the first national education training standards for hemorrhage control training.

SURGICAL CRITICAL CARE INITIATIVE



DIRECTOR: ERIC ELSTER, M.D., CAPT (RET.)

MISSION

The Surgical Critical Care Initiative (SC2i) advances the care of critically ill combat casualties and civilian patients by leveraging precision medicine that integrates biomarkers, clinical data, and artificial intelligence.

VISION

To become a driving force for change in surgical care management using precision medicine.

OVERVIEW

SC2i was established in 2013 to develop biomarker-driven Clinical Decision Support Tools (CDSTs) to guide clinicians in the treatment of critically ill patients.

SC2i is a consortium of seven federal and non-federal entities focusing on the development, translation, and clinical validation of data-driven approaches toward surgical critical care. It capitalizes on unprecedented advances in combat casualty care and surgical research now emanating from military experience with critically injured service men and women. In addition, SC2i partners with the DoD as well as civilian academic surgeons to allow for the evolution and refinement of the best practices for the care of critically injured patients.

SC2i consortium partners include:

- USU
- Walter Reed National Military Medical Center
- Navy Medical Research Center
- Henry M. Jackson Foundation for the Advancement of Military Medicine
- Duke University
- Emory University
- DecisionQ

SC2i focuses on paradigm-shifting approaches to patient management that combine biological data assimilation with protocolized decision support algorithms to provide the best treatment decisions for clinicians. The partnering of the DoD with civilian trauma centers will speed the validation and implementation of evolving surgical practices within the military, while leveraging insights gained from military experiences to improve civilian surgical quality.

SC2i has enrolled more than 2,400 patients with biospecimens as well as an additional 2,900 patients enrolled with data only. It has aggregated more than 68 million data elements in its central data repository to power the development of more than a dozen CDSTs. SC2i implemented a strategic pivot in 2020 by launching product teams to expedite the development of two of its most advanced CDSTs: Artificial Intelligence Sepsis Expert (AISE) and WoundX™.

TOP *SC2i* DELIVERABLES

1. AIDEx-AISE (Materiel Solution)

AIDEx-AISE received a regulatory opinion that it meets the definition of Software as a Medical Device. SC2i is conducting a regulatory pathway analysis to determine the strategy for FDA approval. Last year AIDEx obtained accreditation within the MIP's Authority to Operate. AIDEx-AISE will lead to improved outcomes through early identification and intervention of sepsis in ICU patients. This will contribute to ICU readiness, improved outcomes, and lower costs, as well as pilot a proof-of-concept for data-driven tools within the MHS.

2. WounDxTM (Materiel Solution)

The WounDxTM CDST provides the surgeon with a patient-specific probability that a wound will heal normally post-closure. SC2i is working with regulatory consultants to determine the appropriate pathway for implementing an FDA clinical trial. Complex extremity injuries are common among combat casualties and currently there is no diagnostic that can predict the optimal time for wound closure. The WounDxTM tool will lead to improved care, lower costs, improved resource availability, and contribute to medical readiness for future conflicts.

3. TripleDx (Materiel Solution)

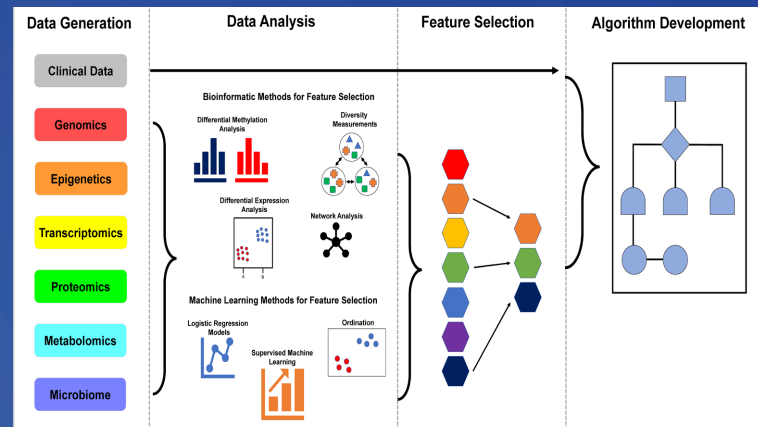
The TripleDx CDST enables early detection of venous thromboembolism (VTE), pneumonia, and acute kidney injury (AKI) using the same diagnostic and predictive platform in a clinical setting. This capability provides three CDSTs for the cost of one. SC2i is working to refine its machine learning models and predictive algorithms in preparation for a future FDA clinical trial. Early identification of VTE, pneumonia, and AKI is essential for aiding clinicians in the treatment of combat casualties. These are also critical complications of trauma in the civilian healthcare system. TripleDx may assist the identification of time-sensitive interventions to mitigate negative outcomes and lower costs across healthcare systems.

4. Multi-omics Profiles of Trauma (Knowledge and Materiel Solution)

SC2i has characterized the response to traumatic injury using multiple "-omics" related techniques on various samples, including the profiling cytokines via MSD and via multi-omics sequencing. These data show evidence for distinct immunologic endotypes in patients related to organ dysfunction and have identified distinct transcriptional profiles in wounds based on outcome and colonization status. SC2i is expanding this by generating single-cell multi-omics data to understand cellular responses to trauma. This work provides evidence that distinct dysregulated molecular profiles can arise from a number of endotypes and that these profiles are associated with outcomes after a trauma. This work establishes a framework for predictive analytics using multi-modal data.

5. Biobank (Knowledge and Materiel Solution)

SC2i's biobank includes 68M data elements in its Central Data Repository and reflects the Center's enrollment of over 2,400 patients with biospecimens and an additional 2,900 patients enrolled with data only. SC2i is developing biobanking procedures for derivative samples, such as nucleic acids in preparation for multi-omics work. The SC2i Bio and Data Bank is accelerating research in precision medicine leading to numerous knowledge and material products for use by surgical care providers worldwide. This shared resource is being leveraged by basic to clinical scientists in military and civilian sectors for novel interrogations of complex trauma-related pathophysiology.



TRI-SERVICE CENTER FOR ORAL HEALTH STUDIES



DIRECTOR: CHRISTA E. GOODWIN, DMD, MS, LTC, DC, USA

MISSION

The mission of the Tri-Service Center for Oral Health Studies (TSCOHS) is to collect, analyze, and report oral health care information, provide dental public health (DPH) education and research support for the Postgraduate Dental College, and support the Military Health System (MHS) so that timely data-driven decisions can be made for:

- Developing oral healthcare policies and programs to achieve optimum dental readiness, warfighter lethality, and to improve the oral health-related quality of life for all beneficiaries
- Creating of greater awareness and understanding of military oral healthcare issues
- Maximizing the efficiency of the military's oral healthcare delivery system
- Advancing of programs that identify environmental and behavioral causes of oral disease and the counter-measures needed to overcome those factors

VISION

TSCOHS will be recognized as the premier institution within the Department of Defense (DoD) supporting the military mission through exceptional DPH research, leadership, and education.

OVERVIEW

TSCOHS has a military relevance by providing data-driven clinical and population oral health research to support military readiness. The Center provides instruction and mentorship to postgraduate dental residents regarding oral health research topics, general dental and oral health subjects, and data sources relating to dental care in the military. In addition, TSCOHS manages the DoD's Dental Patient Satisfaction Survey (DPSS), aggregates and analyzes private sector care dental expenditures, and serves as oral health subject matter experts for TRICARE Dental Readiness Source Selection Evaluation Boards (SSEB). It is staffed by public health dentists who are often the consultants/specialty leaders to their respective services.

TOP **TSCOH**S DELIVERABLES

1. **Support to Residents Obtaining Specialty Certificates** (Knowledge Solution)

TSCOHS DPH specialists provided research support for military residents in dental specialty programs. The mentorship offered throughout their research projects included original research ideas, data analysis support, subject matter expertise, abstract and manuscript development, and protocol reviews. These consultative services facilitate completion of requirements for their specialty certificates or USU master's degrees and prepare them to better understand and interpret the scientific literature in their practice as military dental specialists.

2. **DoD DPSS** (Materiel Solution)

TSCOHS manages the DoD DPSS, a survey that has provided vital information over the past 25 years as to the level of patient satisfaction with the care received at military dental treatment facilities. In 2022, TSCOHS generated monthly reports containing patient comments and numerical survey data metrics. These reports were made available to dental treatment facility leadership within corporate dental systems. The DPSS reports that TSCOHS provides are critical as they are utilized for internal quality improvement initiatives, to assess the impact of changes in operating procedures, and to provide feedback to providers and patients. The DoD DPSS ultimately supports the effort of the MHS to measure and monitor customer satisfaction.

3. **Service Specialty Leaders for DPH** (Knowledge Solution)

TSCOHS staff often serve as DPH specialty leaders for each of their respective services. They advise service leadership on issues pertaining to the specialty, provide guidance to other DPH specialists within the services, and provide career information for dental officers who may be interested in this area of specialization. During 2022, TSCOHS staff guided several dental officers through the challenging process of applying for service-sponsored DPH specialty training and advised leadership on what civilian DPH programs would best suit the current training needs of the services.

4. **Subject Matter Expertise for Defense Health Agency (DHA) SSEB** (Knowledge Solution)

DHA is responsible for providing an optional dental insurance plan for more than 2.1 million military dependents via the TRICARE Dental Program (TDP). When a new contract is required, TSCOHS dental staff are nominated by their respective service to serve as subject matter experts on the SSEB. In 2022, TSCOHS personnel began assisting DHA with completing preliminary requirements for establishing a SSEB for the follow-on TDP, ensuring that military dependents have continued access to an insurance program with a robust network of civilian dental providers.

5. **Active-Duty Dental Program (ADDP) Referral Reports for the Army, Navy, Air Force, and Coast Guard** (Materiel Solution)

The ADDP provides civilian dental care to active-duty service members to ensure their dental health and deployment readiness. In 2022, TSCOHS completed and distributed monthly ADDP network expenditure reports for all services and the U.S. Coast Guard (total of 60 reports). These reports provided leaders throughout the MHS with detailed numerical data, user-friendly pivot tables, and interactive graphs demonstrating the referral source and expenditure type. These reports facilitate the determination of the areas where network expenses can be reduced should the capabilities of those military dental treatment facilities expand.



TRI-SERVICE NURSING RESEARCH PROGRAM



DIRECTOR: YOUNG YAUGER, AN, USA, PH.D., CRNA

MISSION

The mission of the Tri-Service Nursing Research Program (TSNRP) is to facilitate nursing research to optimize the health of military members and their beneficiaries.

VISION

TSNRP will foster innovative research, support partnerships, inform leaders, and support operationally relevant research and evidence-based practice.

OVERVIEW

TSNRP is the country's first and only Department of Defense (DoD) program that supports and allows armed forces nurses to conduct military nursing research that improves the quality of care provided to service members. TSNRP serves the armed forces military nursing community by awarding grants and offering courses to disseminate nursing research, advance evidence-based practice, and develop future nurse scientist leaders through fellowships and the early career investigator coaching program. Congress recognized that military nurses play a critical role to the health and welfare of the global population of the U.S. military and their beneficiaries

and fully authorized TSNRP in Public Law 104-106, Sec. 741, Chapter 104 of United States Code Title 10 and authorized the Secretary of Defense to establish a program of military nursing research at USU. The strategic direction and funding decisions for the program are accomplished by an Executive Board of Directors, which consists of the Nurse Corps Chief from the Army, Navy, and Air Force. Today, TSNRP is funded through the DoD and has awarded more than 500 awards totaling more than \$150 million, resulting in changes to clinical practice, readiness education, and operational military nursing policy. To achieve this mission, TSNRP aims to increase the military nursing research capacity by providing: 1.) opportunities for nurses to engage in TSNRP's focused areas of research investigation; 2.) partnerships for collaborative research among services, components, institutions, disciplines, and agencies; and 3.) resources that support exploration of salient military nursing research issues. TSNRP stakeholder organizations include 17 DoD military treatment facilities (MTFs) and 15 academic organizations that collaborate among six Research Interest Groups (Anesthesia, BioBehavioral Health, Expeditionary Care, Military Family, Health Systems and Informatics, and Military Women's Health).

TOP **TSNRP** DELIVERABLES

1. **“30 Years of Fostering Military Nursing Research and Evidence-Based Practice”** (Knowledge Solution)

TSNRP sponsored the “30 Years of Fostering Military Nursing Research and Evidence-Based Practice” supplement in Nursing Outlook, which included nine articles featuring the operational and military readiness research and evidence-based practice by military nurse scientists. Public access available at:

<https://www.sciencedirect.com/journal/nursing-outlook/vol/70/issue/6/suppl/S2>

2. **Combating Infertility During Military Service: A Grounded Theory Approach** (Knowledge Solution)

The TSNRP funded study conducted by CAPT Jennifer Buechel aimed to understand how active-duty service members (ADSMs) and their partners navigate the infertility care process within the military healthcare system while managing a military career. Understanding how military couples perceive and manage demands of infertility care may enhance access to care, decrease patient costs, improve outcomes, result in better support for military couples who experience infertility, and ultimately improve the health and military readiness of our armed forces. The results support the need for action by providers, policy makers, and military leaders to develop effective DoD policies and infertility treatment programs.

3. **Role of IV Ketamine on Fear Memory and Brain Activation in Male and Female Rats** (Knowledge Solution)

The TSNRP funded study conducted by CAPT Kennett Radford, Ph.D., CRNA examined the effects of post-fear conditioning intravenous ketamine administration on behaviors, drug metabolism, fear memory, and regional brain glucose metabolism (BGLuM) in female rats compared to males. This preclinical study indicates that there are sex-related differences in the effects of intravenous ketamine on behaviors, analgesia, drug metabolism, fear memory, and brain glucose utilization that could impact future ketamine dosing and treatment protocols as personalized medicine is improved.

4. **Microcurrent Therapy for Chronic Low Back Pain: Randomized Controlled Trial** (Knowledge Solution)

The TSNRP funded study conducted by COL Ann Naybeck Beebe, Ph.D. had three research goals: 1.) examine the efficacy of microcurrent therapy (MCT) in reducing low back pain intensity and medication use in military service members; 2.) determine its effect on secondary mental and physical health outcomes; and 3.) explore the MCT effect on serum pain biomarkers. MCT is a self-care complementary and integrative medicine modality. For service members with chronic back pain, this study demonstrated MCT may not be a first-line treatment of choice since it performed no better than a sham. However, it produced clinically important differences in pain intensity and physical functioning, which supports its continued use to manage chronic back pain symptoms in service members.

5. **Evidence-Based Practices for Ultraviolet Disinfection in the Clinical Environment** (Materiel Solution)

The TSNRP funded evidence-based project conducted by LTC Gordon West, Ph.D. evaluated the feasibility and effectiveness of rapid ultraviolet (UV-C) disinfection to reduce the bacterial burden of non-critical high touch surfaces at six medical/surgical wards at two military hospitals. During an outbreak of SARS-CoV-2, bacterial burden was significantly reduced on all surfaces, except for personal electronic devices. These results will help inform infection control practices and assist in the development of policies and procedures outlining the optimal use of UV-C technology.

VAL G. HEMMING SIMULATION CENTER



DIRECTOR: FREDERICK C. LOUGH, M.D., FACS, COL, MC, USA, (RET)

MISSION

Deliver and develop leading edge advances in medical simulation education, research, and readiness.

VISION

The Val G. Hemming Simulation Center (SimCenter) will be a Center of Excellence that promotes expertise in medical education on the cutting edge of simulation technology and medical readiness while providing assessment and validation of clinical skills in collaboration with other organizations to provide a return on investments.

OVERVIEW

The SimCenter is a 30,000-square foot university resource dedicated to delivering high-quality healthcare simulation activities to all learners. In addition, the Center is a research lab currently managing over one million dollars in external grants. The SimCenter also serves as a test bed for studies in healthcare in addition, the SimCenter maintains national accreditations with the Society for Simulation in Healthcare and the American College of Surgeons and collaborates with Walter Reed National Military Medical Center, Fort Belvoir Community Hospital, and

Joint Base Andrews as part of the National Capital Region Simulation Consortium. The SimCenter serves as an advisor in healthcare simulation to USU and the Department of Defense and assists the Defense Health Agency office of Medical Modeling and Simulation in the simulation cost benefit analysis process to generate simulation requirements across all services.



TOP *SIMCENTER* DELIVERABLES

1. Clinical Skills Simulation Trainings (Knowledge Solution)

The Clinical Skills team provided more than 180 simulation events for more than 800 combined learners from the School of Medicine, Graduate School of Nursing, Clinical Psychology, and Graduate Medical Education. These simulation events are a knowledge solution that provide both formative and summative assessments of learners, allowing students to develop clinical skills. Data is collected and provided to faculty to determine what skills are being actualized. Faculty can identify learners who may need assistance mastering specific clinical skills. Student performance data is analyzed, allowing the SimCenter to track performance in simulation over time. The pandemic allowed the SimCenter to implement virtual and remote simulation and it now conducts a hybrid of simulation activities.

2. Performance Determination and Criteria (Knowledge Solution)

Under a JPC-6 five-year grant, the SimCenter in 2021 completed its development and analysis of performance in five critical wartime skills: surgical airway, lower leg fasciotomy, lateral canthotomy of the eye, resuscitative endovascular balloon occlusion of the aorta, and handover of critically ill patients. All these skills had their expert level determined, collected data on novices undergoing training, and analyzed the data to construct learning curves and outcomes. The knowledge solutions contribute to improved medical trainings to develop lasting skills in these procedures. In 2021, study results were presented at various national meetings, including the Military Health System Research Symposium (MHSRS) and the American Society of Ophthalmic Plastic & Reconstructive Surgery (ASOPRS) Annual Fall Scientific Symposium.

3. ChemBio Immersive Team Scenarios (Materiel Solution)

In 2021, the Virtual Medical Environments team finalized two ChemBio immersive medical team training scenarios. These materiel solutions advance insight as to the utility and challenges specific to ChemBio instruction and enhance readiness by increasing the effectiveness of medical team trainings in simulated immersive austere environments.

4. AR/VR Wartime Skills Refreshers (Materiel Solution)

Under SBIR and STTR efforts, the SimCenter has participated in developing augmented and virtual reality software applications to refresh critical wartime skills described above. In 2021, the usability and accessibility of these materiel solutions so they run on both Android and iOS platforms, which will allow additional learners to use the refresher tools and maintain their skills regardless of their type of device.

5. SimCoach Virtual Patient (Materiel Solution)

The SimCenter developed a virtual reality platform for our students to refresh their musculoskeletal skills using an intelligent tutor and feedback (Simcoach). We worked in collaboration with the Institute for Creative Technologies at the University of Southern California to produce this novel materiel solution.





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