

USU CENTERS

ANNUAL REPORT 2021



USU

Uniformed Services University



TABLE OF CONTENTS

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

USU Centers Meet Critical Needs of the Military Health System

During the past year, the Uniformed Services University (USU) Centers continued their exceptional research efforts not only to provide improved outcomes for those impacted by the pandemic, but also to improve the lives of our service members and their families impacted by military conflicts. Each Center has an ambitious strategic plan that responds to the challenges of today and tomorrow by supporting USU's objectives in research, education, and leadership. The USU Centers continue to play a vital role in research on challenges impacting the Military Health System, the American public, and our international partners.

COVID research efforts performed by the USU Centers have impacted the public both nationally and internationally. The Center for the Study of Traumatic Stress joined the Greater New York Hospital System in the creation and dissemination of a wellness and resilience program for healthcare providers engaged in the care of patients with COVID. Initially developed and given to the Greater New York Hospital System, it was then developed for distribution widely around the nation. The Infectious Disease Clinical Research Program contributed to the National Institutes of Health's "Coronavirus Disease 2019 (COVID-19) Treatment Guidelines." Since its first publication in April 2020, these guidelines have been updated 38 times, and as of November 2021, received over 27 million page views from national and international sites. Internationally, the Center for Global Health Engagement supported the United States Africa Command (AFRICOM – including Ghana, Senegal, Rwanda, and Uganda) to develop deployable level 2 hospitals for United Nations peacekeeping missions. These field hospitals were then activated and utilized successfully in each of these countries to support their response to the COVID pandemic.



As we embark on a new year of exciting work in education, research, and leadership, our critical work in areas of diversity, equity, and inclusion endures. In order to create the highest quality military and public health physicians, scientists, and healthcare professionals, we will ensure that multicultural diversity is part and parcel to what we do each day both here at home and while deployed.

During this past year we have refined our oversight process for the USU Centers. These new measures are helping to break down silos across the organization, to develop best practices as we learn from each other, and to ensure that our research efforts are seamlessly aligned with our education efforts. We are also developing three research hubs (Combat Casualty Care, Brain and Behavior, and Infectious Disease), which are envisioned to improve not only collaboration across the university, but also to better coordinate efforts with our external partners.

The USU Centers continually seek to tackle new challenges and priorities of the Department of Defense. It is our hope that this 2021 report will give readers an appreciation for the Centers' impact on the Military Health System through research, education, and leadership.

Sincerely,

A handwritten signature in black ink that reads "Wanda Salzer".

Wanda Salzer, MD, Col, USAF, MC
Associate Dean for Research
Director, Council of Centers Directors
F. Edward Hébert School of Medicine
Uniformed Services University of the Health Sciences

AFRRI

ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE

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

MISSION

The Armed Forces Radiobiology Research Institute (AFRRI) is a unique national asset responsible for preserving and protecting the health and performance of U.S. military personnel that operate in potential radiologically contaminated multi-domain conventional or hybrid battle spaces as well as urban environments. Through research, education, and operational training, AFRRI helps advance understanding of the effects of ionizing radiation in line with the 21st century dynamic threat landscape and national security threats posed by non-state actors, hostile state actors, and near-peer adversaries. AFRRI also provides rapidly deployable radiation medicine expertise in response to a radiological or nuclear event domestically or abroad.

The broad scope mission of AFRRI, which has been affiliated with USU since 1992, includes maintaining a pool of highly qualified radiation biologists to conduct basic and applied research in identification and early development of measures to prevent, assess, and treat radiation injury. AFRRI scientists conduct and publish research critical to the Department of Defense (DoD) for force health protection and contribute to the health and well-being of the population at large. AFRRI research thrusts include development of radiation medical countermeasures, diagnosis of radiation induced injury (biodosimetry), low dose/low dose rate/late effects of ionizing radiation, internalized radionuclides, combined injury, and radioinformatics (bioinformatics applications for radiation biology).

VISION

AFRRI promulgates and operates with the vested ethos of workforce diversity, integrity, dignity, and respect, while engaging in cutting-edge strategic research, education, and operational reach-back. Our commitment is to be medically prepared to save lives and achieve long-term health outcomes as much as possible, while preserving operational forces' resilience

and fighting strength in the event of adversarial use of nuclear weapons. By 2025, we envision a strong committed engagement of valor, agility, dedication, and strength to outperform our last 60 years of time-sensitive support to the DoD's mission. We will continue our invaluable support by developing easy tactical and strategic reach-back tools, applying our knowledge through education, and developing state-of-the-art deployable tools and countermeasures.

OVERVIEW

AFRRI is the most unique and the most powerful radiological research agency in the western world with six decades of active and outstanding support to the DoD through research, reach-back, and education. AFRRI 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 2022 Ukraine crisis and everything in between, such as the 2011 Fukushima nuclear scare, the 2001 anthrax attacks, and the current novel coronavirus pandemic. AFRRI houses a 1.1-megawatt nuclear research reactor to support the work of highly distinguished principal investigators studying biodosimetry, combined injury, metal toxicity, low dose radiation, radioinformatics, and medical countermeasure development. Additionally, the AFRRI Military Medical Operations (MMO) team operationalizes the research performed at AFRRI and brings operational needs from the force to the Institute. MMO maintains three Medical Radiobiology Advisory Teams. These teams are ready to rapidly deploy worldwide to advise combatants commanders and on scene commanders during domestic or global radiological or nuclear accidents/incidents. Finally, MMO provides educational outreach via the Medical Effects of Ionizing Radiation course that offers CONUS and OCONUS critical training to military and/or civilian personnel, including physicians, nurses, medical providers, and first responders.

TOP DELIVERABLES

1 Response to a Radiological or Nuclear Incident (Materiel Solutions)

Nuclear deterrence can operate as a pillar of international security in conjunction with negotiations and agreements on the limitation, reduction, and nonproliferation of nuclear weapons. Models and simulation were developed as they are required to reflect scenarios relevant to the battlefield, to enhance planning and improve human response estimates used in personnel risk and casualty criteria for nuclear weapons effects and other military doctrines. These efforts were conducted in coordination with the Defense Threat Reduction Agency (DTRA) and the U.S. Army Nuclear and Countering Weapons of Mass Destruction Agency. A key publication, DTRA-TR-21-001, "Analysis of Hazard Prediction and Assessment Capability (HPAC) Fallout Source Terms" was a direct product of the exercise. This approach is critical to strengthen disaster preparedness response, with an emphasis on strategic plan development to prevent personnel risk during mass casualties.

2 Medical Care Post Nuclear Detonation (Knowledge Solution)

In response to a tailored request, AFRRRI conducted a hands-on tabletop exercise to provide a critical assessment of capabilities and gaps to military commanders. The military personnel and responders addressed the unique challenges of a nuclear response and focused on the first 24 to 72 hours after detonation, which is the most critical time to save lives during a nuclear detonation incident. This critical exercise involving subject matter experts provided a report that can be used for strategic and tactical planning by field commanders for radiological emergencies.



3 Radiation Biology and Response Training (Knowledge Solution)

To support DoD response to U.S. nuclear weapon and radiological materiel incidents (DoDD3150.08), AFRRRI's Military Medical Operations Department conducted several Medical Effects of Ionizing Radiation (MEIR) classes, both CONUS and OCONUS throughout the year. MMO members supported DTRA's effort of RADIAC backpack testing, testing exercises attempting to isolate effective dry decontamination methods, and testing of hands-free RADIAC detectors. MMO also supported USUHS SOM 2021 Bushmaster field exercise and tri-service thermal testing of uniforms and body armor at White Sands Missile Range. MMO assisted the U.S. Army Nuclear and Countering Weapons of Mass

Destruction Agency with the review, update, and inclusion of AFRRRI research in the revision of DA PAM 50-7, "Personnel Risk and Casualty Criteria from Nuclear Weapons Effects." All these efforts provide medics and first-responders tools and understanding in evaluating the risk while operating in potentially hazardous areas and apply appropriate protective actions recommendations and operational exposure limits to maximize the preservation of life, mitigate suffering, protect critical infrastructure, and secure classified materials.

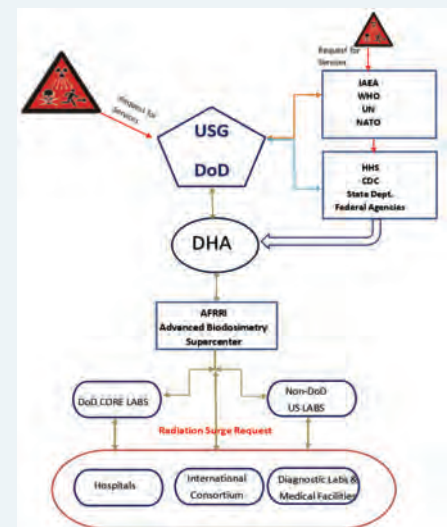
4 Development of Radiation Medical Countermeasures (Materiel Solution)

AFRRRI's scientists are leading a robust research program focused on developing and deploying new medical countermeasures to mitigate the effects of exposures to ionizing radiation. AFRRRI has partnered with the Joint Program Committee-7/Radiation Health Effects Research Program and the Radiation and Nuclear Countermeasures Program at NIAID, which resulted in 22 promising candidates for advanced testing for radiation countermeasures. This strategic partnership has transformed both knowledge and availability of potential materiel solutions in the area of Radiation Medical Countermeasures.

5 Biodosimetry and Improving Preparedness (Knowledge Solutions)

In response to the Senate Report SR 114-63, which demands to establish a certified DoD Biodosimetry Network that can operate and sustain throughput demands during radiation mass casualty, AFRRRI developed a business case analysis and presented to the Defense Health Agency, Office of the Surgeon General, Health and Human Services, and DoD staff. AFRRRI is engaged towards clinical lab accreditation to perform radiation exposure assessment using Dicentric Chromosome Assay, which will augment our ability to triage after a nuclear radiological disaster and support the DoD. This will close a critical gap in our nation's ability to respond to a radiological or nuclear incident.

AFRRRI successfully completed the U.S. Nuclear Regulatory Commission (NRC) inspection of license 19-08330-02 with no cited deficiencies and the reactor is poised to be re-started by late spring 2022.



4D BIO³

CENTER FOR BIOTECHNOLOGY

DIRECTOR: VINCENT HO, M.D., MBA

MISSION

The mission of the Center for Biotechnology (4D Bio³) is to support and enhance the readiness, health, and well-being of America's warfighters, veterans, and their families by innovation, modernization, and translation of state-of-the-art biomedical technologies and services.

VISION

By the end of 2024, 4D Bio³ will be a Department of Defense (DoD) Center for Technology aligned under USU and the central hub within DoD for biotechnology research, innovation, and medical translation for the Uniformed Services. We will have demonstrated our value to the DoD.

OVERVIEW

4D Bio³ originated as a five-year research program initially funded by the Defense Health Program. The intent for establishing the Center was to fast-track the 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 of novel biotechnology for optimization to warfighter health, readiness, and lethality. 4D Bio³ by design is capable of investigating biotechnology solutions at any technology readiness level or manufacturing readiness level.

Over the past two decades, there has been an explosion of advanced biotechnologies in the fields of additive manu-

facturing, bioprinting, artificial intelligence, systems biology, proteomics, genomics, 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 healthcare and bioengineering. 4D Bio³ consists of three main mission domains: 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:

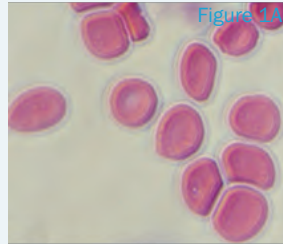
- **Readiness** ("Warfighter Assessment of Readiness Needs" or WARN)
- **Austere Biotechnology** ("For Austere Military Environments" or FAME)
- **On-Demand Blood** (ODB)

In addition to its USU SOM graduate education program (M.D. and Ph.D.), the Center has several additional 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), for Enlisted Workforce Development and for Diversity STEM.

TOP DELIVERABLES

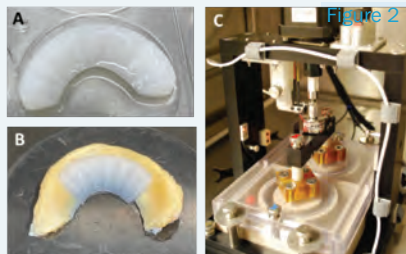
1 Manufactured RBC Cell Therapeutic and RBC Bioreactor (Materiel Solution)

4D Bio³ successfully translated the production of human red blood cells (RBCs; **Figure 1A**) from the lab into two self-contained expandable stir-based prototype desktop bioreactors (**Figure 1B**) for autonomous manufacturing of RBCs. This innovation provides the potential of On-Demand Blood in austere locations, reducing the logistical requirement for cold chain transport and testing of RBCs. The first national blood crisis announced by the American Red Cross this past year because of the multi-factorial issues reducing the current donation-based national blood supply during the COVID-19 pandemic highlights the need for alternatives such as the On-Demand Blood program as a national security issue for the nation's health.



2 3D Printed Human Meniscal Repair Device and Conditioning Bioreactor (Materiel Solution)

4D Bio³ successfully developed a 3D printed human meniscus (**Figure 2A**) with structure and biochemical composition similar to that of a natural human meniscus, initiated surgical repair using the meniscal tissue (**Figure 2B**) and built a dynamic bioreactor (**Figure 2C**) to better simulate stress on the meniscus during tissue growth. The ability to manufacture human meniscal tissue presents a new therapeutic option for potential improved repair of meniscal injuries, which are nearly 12 times more common in active-duty service members than in the general public. Long-term follow-up of service members who underwent meniscal repair revealed that 80 percent of service members were ultimately able to return to duty but approximately 34 percent of those required a permanent duty restricting profile, which results in slightly over half (54 percent) of service members returning to full duty following repair of their meniscal injury using current available techniques.



3 3D Printed Osteochondral Plug (Materiel Solution)

4D Bio³ successfully engineered a bioengineered alternative to native cartilage and underlying bone tissue for the treatment of osteochondral injuries which typically

lead to osteoarthritis, a degenerative disease that affects one in seven adults in the U.S. and is a major cause of chronic pain, mobility limitation, and reduced quality of life. Osteochondral injuries are common in military service members who over the age of 40 have over twice the incidence of osteoarthritis than the general population.

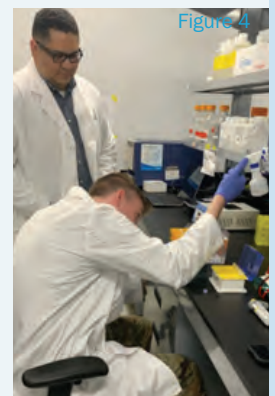
4 Technology & Operational Readiness Center for Health (TORCH) Site (Materiel Solution)

4D Bio³ in partnership with 59th Medical Wing and Brooke Army Medical Center created the TORCH operational medicine proving ground on Joint Base San Antonio Lackland. The TORCH site serves as the principal Training & Education validation center for emerging fieldable innovative technologies for operational medicine. The assessment and validation of new technologies will be performed during both manikin and live-tissue training (**Figure 3**) throughout the continuum of care and interoperability across multiple operational and austere environments.



5 Educational and Training Programs (Knowledge Solution)

4D Bio³ has made filling the bioengineering gap within both USU and DoD a priority. This year, the Center launched "Foundations of Bioengineering" (MCB 1000) under USU's Molecular and Cell Biology graduate program, provided mentorship and lab support for a military graduate student's dissertation, and sponsored four medical student research projects. One of our MS1s won a USU Research Days Best Poster award, a prize usually given to MS4s. Our collaborations with USMA West Point and USAFA continued cadet instruction at the academies plus internships at our lab (**Figure 4**). One of our interns won USAFA's award for Best Cadet Summer Research Project in the Basic Sciences Division. The Center also has continued STEM outreach to encourage women and underrepresented minorities to pursue bioengineering careers. One of our female summer interns will be enrolling in the Biomedical Engineering program at Duke University in fall 2022.



CDP

CENTER FOR DEPLOYMENT PSYCHOLOGY

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

The vision of CDP is a future in which 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 in the unique needs and challenges of

treating service members, veterans, and their families. To date, over 86,000 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.







CGHE

CENTER FOR GLOBAL HEALTH ENGAGEMENT

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

MISSION

Provide operational support to the DoD Global Health Engagement (GHE) enterprise to meet national security objectives. The Center for Global Health Engagement (CGHE) accomplishes this by providing: a hub for GHE thought leadership and knowledge; operational support to the Joint Force; education and training; research and scholarship; and assessment, monitoring, and evaluation.

VISION

By the end of Calendar Year 2022, CGHE will be globally recognized as a leading institution for the DoD GHE enterprise.

OVERVIEW

Despite the ongoing COVID-19 pandemic, the mission of CGHE expanded throughout 2021. CGHE responded to the needs of the Combatant Commands (CCMDs) by launching new initiatives and continuing to deliver excellent performance on existing ones. These included knowledge-building activities, such as Medical Evaluations Describing Interoperability Capability Assessment Levels of Partner Trauma Institutions or Non-battle injury Services (MEDICAL OPTIONS) as well as the African Partnership Outbreak Response Alliance program evaluation. Capacity building activities included the Ukraine-

Building Partnership Capacity in Military Medicine program. The Center continued to support the Office of the Joint Staff Surgeon by providing COVID-19-related subject matter expertise to the Surgeon and other Joint Staff offices.

CGHE's operational support to the CCMD's Surgeon's Office is second to none within the DoD. CCMD is proud of that fact given its short five years of service as a Center. CGHE remains aligned to USU's three mission domains and acts as an external arm of USU by aligning its efforts to DoD and U.S. government priorities. Despite travel and planning restrictions, CGHE has advanced the GHE mission through strategic, operational, and tactical activities, both virtually and in-person. This next year will see new opportunities as our external stakeholders focus on the DoD Biodefense Posture, while remaining steadfast in supporting allies and partners.

CGHE knows it cannot do this alone, so it relies on a robust experienced matrix of skill sets and connections throughout the DoD and the interagency. The GHE enterprise has come a long way thanks to their collective belief in the mission. CGHE hopes to continue to carry the torch for years to come to ensure it builds on lessons learned and consolidates critical knowledge in a way that is sustainable and useful to DoD requirements and needs.

TOP DELIVERABLES

1 Support to USAFRICOM's African Peacekeeping Rapid Response Partnership (APRRP) (Materiel Solution)

Despite postponement of all in-person security cooperation activities due to COVID-19, CGHE, on behalf of USAFRICOM's Surgeon's Office and in coordination with the Office of Security Cooperation at the U.S. Embassies in Uganda, Rwanda, Ghana, and Senegal, continued to actively support the APRRP medical line of effort. This included developing and conducting a series of virtual engagements to remain on target with meeting program objectives. In 2021, CGHE delivered 40 virtual and 6 in-person courses to 406 foreign military personnel. This program was highlighted by State Department and DoD partners as a success story when partner militaries were able to deploy their field hospitals in response to the COVID-19 pandemic. This showcased the value of CGHE's robust field hospital training, which strengthened partner nations' self-deployable rapid response capability under tight timetables.

2 Global Health Security Support to USINDOPACOM (Knowledge Solution)

CGHE continued to provide subject matter expertise and operational support to USINDOPACOM's leadership through partnership-focused Global Health Security efforts. This included taking an all-hazards, partner-focused, integrated approach to identify and address health security gaps in the Indo-Pacific region and advance military, security sector, and civilian cooperation and collaboration in health security. This CGHE effort provides value to USINDOPACOM by identifying health security gaps and formulating a way ahead in theater campaign support to strengthen alliances and partnerships in keeping with DoD strategic objectives.

3 African Partner Outbreak Response Alliance Program Evaluation (Knowledge Solution)

CGHE launched a program evaluation of the African Partner Outbreak Response Alliance (APORA) with support from USAFRICOM's Surgeon's Office. The evaluation supports the command's efforts to develop sustainable health security alliances amongst African partners. This research, conducted by CGHE, will help expand USAFRICOM's understanding of its existing military-civilian activities and collaboration with a focus on value and return on investment, which can later inform future resourcing decisions.

4 Medical Evaluations Describing Interoperability Capability Assessment Levels of Partner Trauma Institutions or Non-battle injury Services (Knowledge Solution)

CGHE kicked off the Medical Evaluations Describing Interoperability Capability Assessment Levels of Partner Trauma Institutions or Non-battle injury Services (MEDICAL OPTIONS) Needs Assessment. This project will develop a framework for conducting and organizing medical capability and interoperability surveys that support medical operations and GHE planning, thereby improving the DoD's current understanding of partner health capabilities in overseas locations to enable decision-making and optimal patient care. CGHE successfully carried out nine focus groups in 2021 and is on track to complete the final report by spring 2022. CGHE efforts will result in the only joint repository for self-assessments of country capabilities across multiple CCMDs.

5 DoD GHE Training Activities (Knowledge Solution)

CGHE conducted three in-person and 11 virtual Fundamentals of Global Health Engagement (FOGHE) courses in 2021, which resulted in training 358 students. These courses increased the capabilities of MHS personnel to understand GHE planning and execution in direct support of four geographic CCMDs, the National Guard, and as part of the pre-deployment training efforts of the U.S. Army and U.S. Navy GHE missions. Two FOGHE II courses were also delivered in USEUCOM and USAFRICOM, which fills a much-needed gap for advanced planning that is currently not addressed at the CCMD/Component level.

Countries that CGHE supported on behalf of the Combatant Commands



CHAMP

CONSORTIUM FOR HEALTH AND MILITARY PERFORMANCE

DIRECTOR: MELISSA GIVENS, M.D., MPH, CSCS, COL, MC, USA (RET)

MISSION

Optimize warfighter mission performance and family readiness through leadership, community engagement, education, and conducting and translating human performance research.

VISION

Be the premier Department of Defense translational resource in the complete range of disciplines associated with military-unique Human Performance Optimization (HPO) and Total Force Fitness (TFF) for maximizing warfighter readiness and performance and for optimizing the resilience of the global military family. As it continues to evolve, CHAMP will become an asset for the entire U.S. national security community.

OVERVIEW

Established in 2006, the Consortium for Health and Military Performance (CHAMP) is a Department of Defense Center of Excellence that is part of the Department of Military Emergency Medicine at USU. CHAMP serves the U.S. Armed Forces through education, training, research, scholarship, leadership, and service in two areas:

1. HPO (Human Performance Optimization) — The process of applying knowledge, skills, and emerging technologies to improve and preserve the ability of warfighters to execute their mission-essential tasks through enhancement, sustainment, and restoration.

2. TFF (Total Force Fitness) — A whole-person, organizational holistic framework to building and maintaining the optimal health, readiness, and performance of warfighters by using the interconnections among mind, body, spirit, and social relationships. It acknowledges the importance of families, communities, and culture to the execution of mission-essential tasks.

CHAMP's expert staff of scientists 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 human performance and deliver innovative resources for warfighters, their families, military healthcare providers, and the military community as a whole.



TOP DELIVERABLES

1. Warrior Heat- and Exertion-Related Events Collaborative (WHEC) (Knowledge Solution)

CHAMP established WHEC to develop clinical care, education, research, and policy to mitigate exertional illness. WHEC supports the Multidisciplinary Review Committee with DoD clinical-consultation services and provided guidance on more than 50 service member referrals in 2021. CHAMP's Exertion-Related Illness Project developed clinical algorithms and scoring to risk-stratify those with exertion-related events and optimize return-to-duty decision-making. WHEC provides resources on the Human Performance Resources by CHAMP (HPRC). By influencing policy and education, as well as engaged clinical consultation, WHEC is mitigating exertion related illness risk, promoting best practice care, and facilitating return to duty decisions.

2. Total Force Fitness Summit (Knowledge Solution)

Total Force Fitness (TFF) is DoD's holistic framework for optimizing the well-being of warfighters and their families. CHAMP hosted a 2021 TFF Summit with over 300 attendees. Participants concluded: (1.) TFF should reside within the Office of the Under Secretary of Defense for Personnel and Readiness with dedicated resources; (2.) Legacy programs should be reviewed for current relevance; (3.) TFF spans the service member lifecycle; (4.) TFF capabilities should be woven throughout operational units. The TFF summit served as a convening activity encouraging collaboration and sharing of TFF best practice while creating a roadmap for the future of TFF to include an annual TFF Summit.

3. Total Force Fitness Capability-Based Blueprint (CBB) Workshop (Knowledge Solution)

Collaborating with USAF 2W1 Aircraft Armament Systems career field (355th Maintenance Support Group, Davis Monthan Air Force Base support agencies), CHAMP conducted an HPO and TFF Capability-Based Blueprint (CBB) workshop. It began with a CBB report operationalizing DoD Joint Requirements Oversight Council Memorandum 073-18 (11 July 18). The resulting CBB—outlining career-field-critical core tasks, health-and-performance priorities, and line-valued metrics—is being used to improve the operational validation of Davis Monthan services. Capability-Based Blueprinting provides a means to match health and performance services delivery to service members' needs in a mission relevant paradigm.

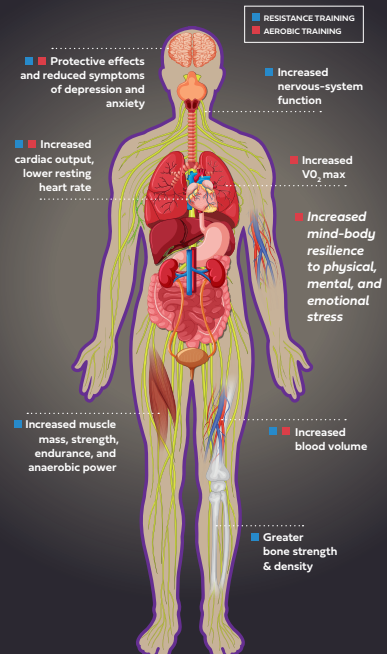
4. Brain Health Guide (Knowledge Solution)

Operation Supplement Safety (OPSS) continues to focus on creating evidence-based content to educate dietary supplement consumers. The OPSS team created a 20-page "Brain Health Guide" in response to the growing number of dietary supplements on the market for brain health and cognitive enhancement. This guide contains articles on nine popular ingredients related to brain health, information about nootropics or "smart drugs," and resources to help consumers make informed decisions about dietary supplements. Warfighter brain health is a DoD priority, and the Brain Health Guide is an important tool for service members who consider dietary supplements for brain health.

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

CHAMP completed a record 150 speaking engagements in 2021 that reached 4,500+ military-community members. CHAMP continued to partner with Military OneSource to deliver live social media events on weight management, dietary supplements, sleep and stress, heat illness, and social fitness. In August HPRC launched an events page featuring 20+ events on brain health, mental wellness, nutrition, and overall well-being. These activities delivered evidence-based Total Force Fitness and performance information throughout the services. CHAMP is answering the call for military relevant and scientifically sound information and education.

MIND-BODY ADAPTATIONS TO EXERCISE



CHPE

CENTER FOR HEALTH PROFESSIONS EDUCATION

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) through leadership in teaching, research, and innovation by building education, research, and leadership capacity through the mentoring of graduate students, health professional trainees (e.g., medical students and residents), and faculty members; generating new knowledge in health professions education through research and innovation educational practices; developing a collaborative community of inter-professional scholars and educational leaders in health professions education; and engaging in education-related knowledge translation activities with the potential to improve patient care and clinical practice.

VISION

The vision of CHPE is to be widely recognized as a global leader in advancing health professions education through leadership in teaching, research, and innovation.

OVERVIEW

In keeping with the USU mission, CHPE is designed to be the premier provider of health professions education for the MHS. Through leadership in teaching, research, and scholarship, CHPE provides the direct benefit to the uniformed services and other federal agencies by producing a cadre of leaders with expertise in the field of health professions education. CHPE has several core activities: 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 DELIVERABLES

1 Growing Learner Impact (Knowledge Solution)

CHPE is educating health professionals to become premier academic leaders in the MHS. CHPE currently has over 200 learners in the program including 160 physicians, 10 dentists, 7 nurses, and 28 with a variety of other health professions degrees serving in over 55 military treatment facilities around the world. Alumni currently serve as program directors, associate program directors, dean, associate deans.

2 Cutting-Edge Research (Knowledge Solution)

CHPE's research is providing an evidence base on how to best educate health professionals across the continuum. Our research productivity continued to rival top health profession education units internationally. Learners published 24 peer-reviewed manuscripts in the health professions education field, while faculty published more than 100 peer-reviewed manuscripts in top tier journals in addition to a few book chapters, books, editorials, and presentations by our learners and faculty alike. CHPE faculty were awarded more than \$3 million in research grants this year alone.

3 Distance Learning Lab (Knowledge and Materiel Solution)

The Distance Learning (DL) Lab is a core component of CHPE that played a critical part in redesigning

education during the pandemic. The DL Lab has served all stakeholders and this year it has served over 100 faculty across 31 departments, including 180 consultations and 42 workshops on a variety of topics. Additionally, the DL Lab's Faculty Support Resources website reached over 280 users with over 1,414 views.

4 Enhancing Educational Offerings (Knowledge Solution)

CHPE admitted its inaugural class of Master of Education in Health Professions Education (MEd-HPE) this year and admitted learners into the MD-Med in HPE degree this year so that CHPE can best prepare leaders in the science of educational innovation. CHPE started the MEd in HPE, and MD-MEd based upon our MHS stakeholder input and requests from learners.

5 Exploring Long-Term Outcomes (Knowledge Solution)

The Long-Term Career Outcomes Study (LTCOS) is a core component of CHPE that plays a key role in SOM accreditation in addition to evidence informed education. It is a multi-departmental team that provides a unique model of educational epidemiology whereby educational processes can be linked to educational and patient-care outcomes. For example, LTCOS investigators plan to publish a "Military Medicine" special edition on the full spectrum of medical education at USU, from admissions to years into medical practice.



CHSR

CENTER FOR HEALTH SERVICES RESEARCH

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 (HSR). CHSR 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. In addition, it recommended a dedicated program of training and analytics to build this capacity for current and future efforts. Although the size of the staff (less than 10 people) and annual budget (\$2M) are small compared to the annual \$53B MHS budget,

CHSR 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 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, expanding USU's HSR capacity, and becoming recognized as the thought leader for military HSR across MHS, DoD, and the nation.
- Direct Support Services – Responding to requirements and ad hoc queries generated from organizations and units within DoD and the MHS, particularly emerging HA/DHA priorities, and establishing enduring relationships with MHS HSRP customers.
- Service to the Nation – Support to civilian HSR organizations, the interagency, and national efforts on demand, including the Veterans Administration and the White House.

TOP DELIVERABLES

1 Establishment of CHSR (Materiel Solution)

In 2021 the former Health Services Research Program was officially recognized as CHSR, following a three-year journey of strategic planning with representatives from USU, the Defense Health Agency, and OSD(HA). This has enabled greater engagement with federal policy-makers, greater visibility within the health services research and military health communities, and elevated the impact of our research, capacity building, and service products.

Official recognition of CHSR has greatly expanded the influence and impact of research, service, and capacity building for the MHS.

2 Launch of the Military Health System Response to COVID-19 (MiHReC-19): A Health Services Research Approach to Sustainable Process Improvements (Materiel and Knowledge Solution)

CHSR launched MiHReC-19, a large multiyear research project in partnership with Brigham and Women's Hospital/Harvard Medical School that aims to investigate the impact of the COVID-19 pandemic on the MHS. This research will enable the application of innovative techniques, models, and findings by the MHS and other health systems nationwide.

Lessons learned from the COVID-19 pandemic on the MHS can provide a foundation for improving quality of care and decision-making for patients nationwide during future crises.

3 Future Directions for the Intrepid Spirit Centers (Knowledge Solution)

CHSR was tasked to develop insight as to the placement of additional Intrepid Spirit Centers. CHSR supported this endeavor by reviewing the prevalence of disease and geographic density of Traumatic Brain Injury (TBI) among active duty, National Guard, reservist, and retired military populations, and provided recommendations for future locations.

This study will directly inform future Intrepid Spirit Center locations leading to increased access to TBI care for those serving in the Reserves and National Guard as well as veterans.

4 Racial Disparities in the MHS (Knowledge Solution)

In the United States racial and ethnic disparities are a well-documented phenomenon, even among publicly funded systems. Through construction of a framework synthesis of previously published research, CHSR determined that many racial disparities seen elsewhere in the United States healthcare system are greatly reduced or eliminated in the MHS, particularly in the direct care system.

This synthesis demonstrates that universal coverage available through TRICARE and the MHS serves as a model for reducing racial disparities in healthcare utilization and outcomes experienced elsewhere in the U.S. health services system.

5 Database Workshops (Materiel and Knowledge Solution)

The Center has hosted five workshops on subjects including the MHS Data Repository (MDR), DoD-VA Infrastructure for Clinical Intelligence (DaVINCI), and the Army's Person-Data Environment (PDE), for more than 100 nationwide participants each session. CHSR's public purpose and military support mission unite in the goal of facilitating training on and access to MHS-relevant databases.

These trainings have made CHSR the go-to resource for enabling expertise in data access and training while increasing capacity across the enterprise to deliver rigorous and relevant health services research.



CMPH

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 Cardiovascular Outcomes Research (MiCOR) Program address-

es 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 2021, MiCOR has screened 4,500 midshipmen for asymptomatic cardiovascular disease.

Current projects focus on the prevention of obesity, the cardiovascular consequences of traumatic brain injury and other cardiovascular outcomes, integration of pharmacogenomics into the MHS, and identifying potential deleterious effects of intense endurance exercise. 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 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 DELIVERABLES

1 Identification of Immunopathological Features in Multisystem Inflammatory Syndrome in Children and Pediatric COVID-19 (Knowledge Solution)

Pediatric Coronavirus Disease 2019 (pCOVID-19) is rarely severe; however, a minority of children infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) might develop multisystem inflammatory syndrome in children (MIS-C), with substantial morbidity. In this longitudinal multi-institutional study, we conducted molecular profiling and applied multi-omics (analysis of soluble biomarkers, proteomics, single-cell gene expression and immune repertoire analysis) to profile children with COVID-19 and MIS-C (n=76). pCOVID-19 was characterized by type I interferon responses, whereas type II IFN-dependent and NF- κ B-dependent signatures and increased levels of circulating spike protein were detected in MIS-C. Transient expansion of specific T cell clonotypes in MIS-C was associated with signatures of inflammation and T cell activation and the association of MIS-C with the combination of specific HLA alleles suggests genetic susceptibility. These results identify distinct immunopathological signatures in pCOVID-19 and MIS-C that might help better define the pathophysiology of these disorders and guide therapy.

2 Cardiac Screening of Recruits at USNA to Test Enhanced Cardiovascular Screening of all Recruits in Order to Reduce Sudden Cardiac Arrest and Death (MiCOR) (Knowledge Solution)

In response to two sudden cardiac deaths (SCD) and one life-threatening cardiac syncope at the U.S. Naval Academy (USNA) in 2020, CMPH/MiCOR scientists implemented a practical screening program at the USNA to reduce SCD. SCD is the leading non-traumatic cause of death in military recruits. Cardiovascular screening of recruits in the U.S. military is currently limited to a focused history and physical exam. This novel screening typically takes about 12 minutes. The data will be presented at the 2022 American College of Cardiology meetings. To date, 5400 USNA midshipmen have been screened using this protocol and novel electrocardiographic device. Serious cardiac abnormalities have been found in 0.46 percent of recruits with less than a 2 percent false positive rate resulting in the 2022 NDAA requiring expansion of this screening to USMA and USAFA.

3 Precision Medicine Special Issue in Military Medicine (Knowledge Solution)

Members of the Center for Military Precision Health served as guest editors to create and edit a special edition on Precision Medicine in the Military Health

System for The Journal Military Medicine. This special edition was published Jan/Feb 2002 as Volume 187, Supplement 1 and consists of seven articles related to precision medicine and medical care, genetic counseling, national security, pharmacogenetics, and genomics education. Many of these articles also included authors and co-authors from CMPH as well as authors affiliated with CMPH collaborating entities. This was the first special edition of Military Medicine completely devoted to precision medicine.

4 The American Genome Center Sequencing Satellite Location at AFRRRI (Materiel and Knowledge Solution)

The American Genome Center established and supported its first satellite sequencing location outside of the USU main campus. This satellite sequencing location at the Armed Forces Radiobiology Research Institute has validated capabilities to conduct small scale next-generation sequencing activities using the Illumina NextSeq 500. This sequencing resource enables genomic and transcriptomic profiling data generation and analysis for the AFRRRI research community. In addition, it aspires to establish innovation in molecular diagnostics with future goals in clinical implementation for diagnostics relevant in radioprotection and surveillance of radiation exposures.

5 Personalized Characterization of Clonal Architecture of Acute Myeloid Leukemia (AML) (Knowledge Solution)

Post-residual disease monitoring in AML is complicated by age-related clonal hematopoiesis mimicking tumorigenic mutations driving an individual's cancer. CMPH analyzed tumor whole genome sequencing for exact DNA structural breakpoints in AML driver genes to develop patient-specific primers. Analysis of these exact fusions in single-cell DNA sequencing of the tumor enabled sub-clonal characterization of an individual's tumors. This work (PMID: 34258102) demonstrates that WGS enables customized fusion detection and monitoring of structural-variants not measurable by current off-the-shelf commercial panels.



CNRM

CENTER FOR NEUROSCIENCE AND REGENERATIVE MEDICINE

DIRECTOR: DAVID BRODY, M.D., PH.D.

MISSION

To conduct innovative 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). CNRM conducts rigorous science, with an emphasis on clinical trials, to improve the lives of U.S. warfighters who have sustained traumatic brain injuries (TBIs). Clinical trials performed by CNRM explore novel treatments for TBI-related sequela, such as depression, headaches, and insomnia. This work informs methods that optimize warfighters' 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, CNRM has conducted over 135 studies and enrolled over 9,000 research participants. CNRM has 19 active protocols that are conducted at 16 sites throughout CONUS. The CNRM 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. Its in-house informatics core, biomarkers core, clinical trials unit, and program management team propel CNRM research and provide critical support to external efforts throughout the broader DoD TBI research community. CNRM is making a difference in the lives of warfighters with TBI.



TOP DELIVERABLES

1 Investigating the Effects of Repetitive, Subconcussive Blast Exposures (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 and 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, multisite, 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. 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' dispersed geographical locations and unique schedules. With CNRM's virtual trials, participants have the opportunity to participate in groundbreaking TBI research via tablet or smart device from any location throughout CONUS.



CRSR

CENTER FOR REHABILITATION SCIENCES RESEARCH

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

MISSION

The Center for Rehabilitation Sciences Research (CRSR) leads synergistic rehabilitation-related translational research efforts within the Military Healthcare System and disseminates knowledge to the community, 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

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

OVERVIEW

During military operations in Iraq and Afghanistan, over 55,000 U.S. service members have been wounded in action, many surviving severe blast-related poly-trauma that would have been fatal in prior conflicts. Over 1,700 have sustained at least one major extremity amputation, and over 380,000 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. CRSR was established to promote the advancement of rehabilitative care for service members. Since inception, CRSR 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, CRSR facilitates team-based science through interdisciplinary clinical and scientific collaborations to solve clinically relevant rehabilitation challenges and optimize patient outcomes.

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

1. Identify barriers to successful rehabilitation, return to duty, and community reintegration, 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 DELIVERABLES

1 **NCAA-Department of Defense (DoD) Concussion Assessment, Research and Education (CARE) Consortium (Knowledge Solution)**

CRSR is the coordinating center for the CARE Consortium military cohort, partnered with the military service academies, Naval School Explosive Ordnance Disposal, National Intrepid Center of Excellence, and Intrepid Spirit Center Network to follow participants longitudinally to evaluate the acute, intermediate, and long-term effects of mild traumatic brain injury (mTBI) and head impact exposure (HIE). As of 2021, the Consortium has enrolled 50K+ participants and tracked 5K+ concussions, resulting in the introduction or improvement of concussion care guidelines at the military service academies, increased collaboration across Intrepid Spirit Network sites, and over 80 peer-reviewed publications aimed at informing and advancing warfighter brain health initiatives.

2 **Developing a Combat-Relevant Translational Model of Heterotopic Ossification (Materiel Solution)**

Heterotopic ossification (HO) is a debilitating condition which negatively impacts surgical outcomes, rehabilitation, and quality of life. Although this is a well-reported clinical condition, no current mechanisms exist for minimizing formation and recurrence. CSRS collaboration with the University of Utah has



shown through rigorous histological analyses that it is possible to enhance surgical planning, by better characterizing and understanding the bone architecture and how it manifests. Further, over the past decade, CSRS has advanced the field of bone biology and developed sealing mechanisms for the medullary canal to potentially stop this pathological bone growth (since research indicates that factors such as stem cells, negative pressure, infection, and vascular occlusion may be exacerbating this medical hardship). CSRS has demonstrated that it is possible to produce a translational animal model which is the closest to that of human clinical condition and have been recognized in two Army Surgeon General Blast Journals. CSRS is now piloting its technology in the coming months to help service members and validating the utility of its bone cap device. Successful demonstration will result in a pragmatic solution that can be implemented at the time of injury/limb loss to prevent secondary surgeries, unnecessary pain, and assist with readiness and resilience.

4 **Healthcare Utilization (Knowledge Solution)**

This ongoing study aims to quantify the amount of rehabilitation most associated with improved health outcomes (e.g., behavioral health, musculoskeletal injury, and chronic pain) among MHS beneficiaries who have experienced amputation. Included are comparisons across sex, age, beneficiary category, and injury groups. Further quantified will be amputation's impact on family member health and healthcare utilization, filling a gap in knowledge in the existing literature. This research will advance military medicine by identifying the amount and types of rehabilitation most associated with improved health and force readiness.

5 **Mobile Device Outcomes-Based Rehabilitation Program (Materiel Solution)**

The Mobile Device Outcomes-Based Rehabilitation Program (MDORP) uses wearable technology to optimize the care of service members and veterans with lower limb amputation (LLA). MDORP uses a mobile health system and sensors that provide assessment of gait quality, real-time audio feedback to correct gait deviations, administration of clinical outcome measures, and prescription of home exercises based on identified impairments. Successful preliminary results were promising in its ability to improve basic and high-level mobility, lower limb strength, and gait quality in individuals with LLA. Additionally, findings suggested "booster" prosthetic training may be justified in an effort to help maintain an active lifestyle, promote prosthetic use, and mitigate secondary comorbidities. Participants from the initial study provided positive and constructive feedback that offered the research team the opportunity to expand MDORP across more VA facilities, and to examine the usability among treating clinicians and patients on a larger scale. The expansion of MDORP is expected to help patients across the DoD and the VA improve their function, mobility, and quality of life while giving them back time and savings in overall healthcare costs.

CSTS

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 effects of trauma exposure and building 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 the Center's mission is aligned with the needs of the DoD and the nation and 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. The Center informs and educates community, regional, state, national, and global stakeholders in government, industry, healthcare, public health, and academia. CSTS contributes to advancing trauma-informed care by providing leadership in research, education, training, consultation, global health, and service.

TOP DELIVERABLES

1 Study to Assess Risk and Resilience in Service-members – Longitudinal Study (STARRS-LS) (Materiel and Knowledge Solution)

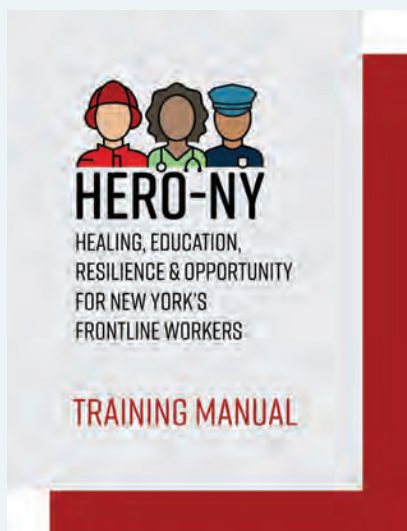
The Army STARRS study is the largest ever conducted on military suicide. Results and recommendations actively shape DoD and civilian mental healthcare for suicide and related risk factors. Over 109 published articles and over 100 recommendations. First ever use of Machine Learning in DoD to identify soldiers at risk of suicide.

2 New York National Guard Warfighter Readiness and Resilience Assessment (Materiel and Knowledge Solution)

At the request of National Guard (NG) leadership, CSTS conducted a survey of nearly 4,000 members of the New York NG and identified risk and protective factors of COVID-19 activations. Using these findings CSTS developed and delivered to NG leadership unit leaders brief, action-oriented fact sheets and pocket cards, with leadership actions to protect mental health and readiness.

3 HERO-NY – SUPPORT During COVID Pandemic To New York City (Materiel and Knowledge Solution)

At the request of the Mayor of New York City (NYC) and USNORTHCOM Commander, CSTS joined the Greater New York Hospital System in the development and delivery of resilience training for healthcare providers and staff. The program was delivered to more than 5,000 workers in the NYC healthcare and first responder system.



4 U.S. Army Mortuary Affairs Consultations (Materiel and Knowledge Solution)

CSTS was asked to partner with CJMAB, DSCA, AR-NORTH, USMC, NGB, NORAD, and USNORTHCOM J4 to deliver the definitive chapter on mortuary affairs stress resilience, educational fact sheets, and a training program on “psychological effects of exposure to human remains,” used to protect mental health and enhance readiness for thousands of service members engaged in missions involving exposure to human remains.

5 15th Annual Amygdala, Stress, and PTSD Conference: Stress and the Mind (Knowledge Solution)

CSTS conducted the “15th Annual Amygdala, Stress, and PTSD Conference: Stress and the Mind,” which included five international expert speakers in the field. Over 500 multidisciplinary registrants from around the world gathered to advance knowledge on bench-to-bedside care for PTSD and other trauma and stressor related disorders for military and civilians.



DMEC

DOD MEDICAL ETHICS CENTER

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

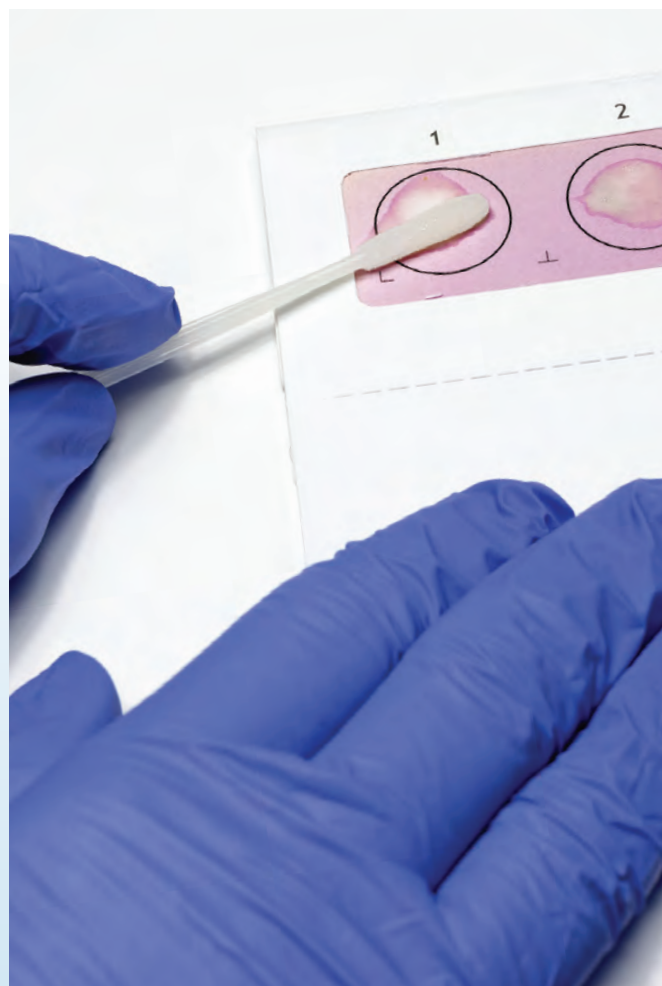
MISSION/VISION

The mission of the DoD Medical Ethics Center (DMEC) is focused on two key domains. First, to function as the national and international lead in military medical ethics for all DoD healthcare professionals, as a centralized resource for healthcare ethics information and consultation. Second, to ensure the growth of USU students into ethical providers and military leaders by creating an environment of top-down and bottom-up medical ethics knowledge exchange.

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 Military Health System (MHS).
2. Deploying a mobile application to house the curriculum of the Bioethics Training Course to reach a broader audience across the MHS.
3. Continuously improving the DMEC Bioethics Consultancy processes to ensure real-world advisory counsel can be provided in a timely manner in both the research and clinical environments.



TOP DELIVERABLES

1 DMEC Bioethics Consultancy Responses (Knowledge Solution)

To date since operational capability (January 2019), DMEC has successfully responded to 91 separate bioethics consultancy requests from MHS healthcare professionals in both clinical and research environments. This response capability is critical to ensure that MHS healthcare professionals and researchers have a centralized knowledge hub for bioethics information as an omnipresent resource.

2 DMEC Bioethics Guidance on the COVID-19 Pandemic (Knowledge Solution)

DMEC created an overarching Bioethics Advisory Opinion regarding the COVID-19 Pandemic, along with two companion bioethics videos in further explanation, which were broadcast across the MHS, and included in the DoD COVID-19 Practice Management Guidelines. This enabled healthcare professionals and medical facility leaders across the MHS to better understand the best practices being implemented in response to the novel pandemic.

3 DMEC/USU “A Code of Ethics for Military Medicine” (Knowledge Solution)

Various members of DMEC (and larger USU and DoD) contributed to “A Code of Ethics for Military Medicine,” Military Medicine, Volume 185, Issue 5-6, May-June 2020, Pages e527–e531, <https://doi.org/10.1093/milmed/usaa007>. This article is a restatement of both the MHS Principles and the AMA Principles, together with comments on the similarities and the differences, which is an incredibly insightful tool for MHS healthcare professionals in the bioethics domain.

4 DMEC Bioethics Training Course (Knowledge Solution)

DMEC created a Bioethics Training Course designed to elevate the foundational knowledge of the personnel assigned to the Medical Ethics Committees (MEC) across the MHS. In so doing, the DMEC is expanding the capabilities of the local Medical Ethics Committees, as well as those of the MHS healthcare providers and researchers.

5 DMEC Bioethics Mobile Application (Knowledge Solution)

DMEC is in the process of expanding our foundational bioethics curriculum, as a mobile based application. This platform is designed to be an interactive guide to provide guidance to MHS health care providers on the foundational bioethics concepts and case evaluation techniques.



DVCIPM

DEFENSE AND VETERANS CENTER FOR INTEGRATIVE PAIN MANAGEMENT

DIRECTOR: CHESTER C. BUCKENMAIER III, M.D., MS, COL, MC, USA (RET)

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 multimodal pain management focused on improving quality of life and function.

TOP DELIVERABLES

1 Patient-Centered Care Through Patient-Reported Outcomes (Knowledge Solution)

Across several manuscripts, DVCIPM research illuminated the importance in understanding clinically meaningful outcomes and treatment optimization. These knowledge products demonstrated the value of NIH PROMIS measures in conducting health services research quantifying treatment requirements in tertiary pain management. Research that leveraged multiple PROMIS measures indicated the importance of regional anesthesia, multifaceted ways in which patients recover from surgery, and the number of treatment hours required for clinically meaningful benefits in patients engaged in interdisciplinary pain management. As healthcare systems, including the MHS, move to value-based care, these findings highlight the potential value of patient-reported outcomes in routine clinical care to support evidence-based programmatic and policy changes that optimize readiness.

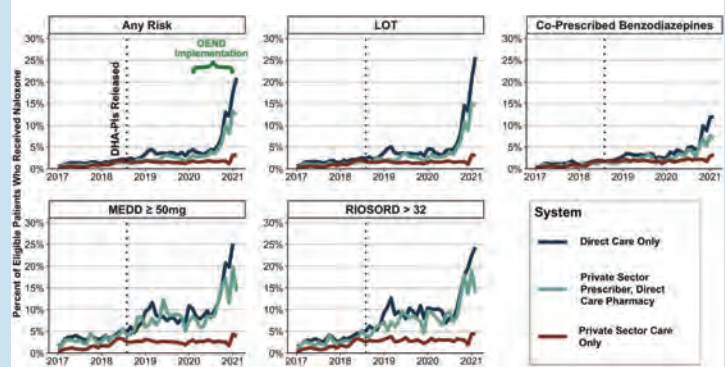
2 Clinical Decision Support Tool Optimization (Knowledge and Materiel Solution)

Through collaboration with DHA and Defense Healthcare Management Systems (DHMS), DVCIPM consolidated interdisciplinary feedback regarding opioid-related decision support tools and utilized a design-thinking approach to arrive at interface improvements for the Opioid Prescriber Monthly Trend Report, Look-Up Tool Dashboard, Opioid Registry, and Look-Up Tool. Additional collaborative research evaluated the sensitivity and risk stratification properties of the Risk Index for Overdose or Serious Opioid-Induced Respiratory Depression (RIOSORD), which is an opioid overdose composite risk score developed by the VHA. Analysis of the original RIOSORD cutoff score initially integrated into DHA policy and programming demonstrated that it potentially underestimated the risk of overdose in the service member population. A temporary “MHS RIOSORD” was developed and deployed throughout the MHS decision support tools.

3 Opioid Overdose Education and Naloxone Distribution (Knowledge and Materiel Solution)

Co-prescribing naloxone to patients assessed to be at higher risk of opioid overdose is an evidence-based best practice that has been demonstrated to save lives. DVCIPM, in collaboration with DHA J9, developed the DHA Opioid Overdose Education and Naloxone Distribution (OEND) Program in 2020. The education and training materials developed for providers, patients, and family members are all available on the Health.mil OEND landing page. As evidenced in the DHA CarePoint dashboards and a recent publication, the OEND Program has resulted in significant increases in naloxone

prescribing across the MHS. Many sites are achieving a greater than 80 percent naloxone prescribing rate for patients who meet criteria for at least one of four risk factors.



4 Pain Registry Biobank (Materiel Solution)

The Pain Registry Biobank is a novel IRB-approved registry consisting of blood/tissue samples and medical history data from enrolled participants, and robust patient-reported outcomes data from the DoD Pain Assessment Screening Tool and Outcome Report (PASTOR) developed at DVCIPM. Linking blood samples with enrollee PASTOR responses and electronic medical record data provides researchers with an unparalleled pain biomarkers resource. The database supports advanced pain clinical research into the biopsychosocial nature of pain and its related genomics and proteomics. DVCIPM continued protocol management through the pandemic with innovative e-consent and protocol changes that included emailing surveys to participants, improved partnering with clinic providers, and optional blood draws.

5 Evaluation of Prototype Ventilator Designs for COVID-19 (Knowledge Solution)

The Department of Defense, Defense Health Agency (DHA) responded to the global health crisis by launching the “Vulcan Innovator Challenge” with the goal to develop easily manufactured, low-cost ventilators. DHA partnered with the USU Department of Anesthesiology and DVCIPM to develop in vivo animal testing of selected limited performance ventilators. This model included a clinically relevant model of acute respiratory distress syndrome. Preliminary results revealed several design flaws in the tested prototypes, which guided refinement of the devices. The multiple test-develop-test cycles allowed correction of many shortcomings, and at the end of the process all five prototype ventilators achieved a performance and design level that enabled Emergency Use Authorizations by the Food and Drug Administration.

IDCRP

INFECTIOUS DISEASE CLINICAL RESEARCH PROGRAM

DIRECTOR: TIMOTHY BURGESS, M.D., MPH, FACP, CAPT, MC, USN

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 have 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; deployment and travel-related infections; human immunodeficiency virus; sexually transmitted infections; wound infections; and in response to the SARS-CoV-2 pandemic, a COVID-19 specific research area to study acute and long-term outcomes of SARS-CoV-2 infections in military populations and beneficiaries.

TOP DELIVERABLES

1 **Epidemiology, Immunology and Clinical Characteristics of Emerging Infectious Diseases with Pandemic Potential (EPICC) Investigates Clinical Outcomes Associated with New SARS-CoV-2 Variants and Explorations into Risk Factors for “Long COVID” (Knowledge Solution)**

Led by Drs. Simon Pollett and Brian Agan (IDCRP), EPICC is a prospective, longitudinal observational cohort study of SARS-CoV-2 infections in active duty service members and DoD beneficiaries to address critical knowledge gaps and inform development of diagnostic, treatment, and preventive strategies. Data collected through EPICC have allowed for characterization of clinical outcomes following SARS-CoV-2 infections, including acute complications and severity, and has contributed to a better understanding of long-term symptoms and complications (“Long COVID”). Findings from EPICC have also been used to validate patient-reported outcome measurement tools through correlation with the host immune response, host genomic markers, and virological data. Immune responses to SARS-CoV-2 infections, including those with emergent variants (e.g., Delta and Omicron variants), have been estimated out to 12 months post-infection and compared with vaccine-induced immunity.

2 **Prospective Assessment of SARS-CoV-2 Seroconversion (PASS) Examinations of Symptoms Associated with Infection, Vaccination, and Breadth of Immunity (Knowledge Solution)**

The acquisition of healthcare-associated, asymptomatic SARS-CoV-2 infections among Walter Reed National Military Medical Center (WRNMMC) healthcare workers is being examined by Dr. Edward Mitre (USU). PASS examined the ratio of symptomatic/asymptomatic infections in a healthcare workers population, as well as how immunity to seasonal coronaviruses and prior SARS-CoV-2 infections correlate with infection risk. The PASS study has characterized the durability and breadth of vaccine immunity, including against Delta and Omicron variants, and the frequency of subclinical and clinical infections after vaccination over time.

3 **Initiation of the Military COVID-19 Registry Analysis Project (M-RAP) (Knowledge Solution)**

The COVID-19 Registry was established by the Joint Trauma System in 2020 to collect data related to SARS-

CoV-2 across military treatment facilities. Led by Dr. David Tribble (IDCRP), M-RAP is analyzing data from the JTS registry to characterize the morbidity and mortality burden associated with acute SARS-CoV-2 infections, with a focus on active duty service members to inform force health protection measures and military readiness. The effectiveness of vaccines (by vaccine type/product) on SARS-CoV-2 infection and outcomes will also be evaluated.

4 **Pragmatic Assessment of Influenza Vaccine Effectiveness in the DoD (PAIVED), Partnership with National Institute of Allergy and Infectious Diseases (NIAID) and 6 DoD Sites, Completes Third Year and Enrollment of Subjects in Final Fourth Season (Knowledge Solution)**

Led by CAPT Timothy Burgess (IDCRP), PAIVED is examining if there are clinically meaningful distinctions in effectiveness and immune responses between influenza vaccine formulations (egg-derived, cell-culture-derived, and recombinant licensed). This study is important as the findings will improve operational readiness by identifying the best vaccine(s) for use by DoD. PAIVED has enrolled a total of 15,354 across the 4 seasons and is preparing for upcoming primary data analyses on the effectiveness and outcomes between the three vaccines.

5 **Meningococcal (Bexsero®) Vaccine for Gonococcal Infection (MAGI Trial) Started at WRNMMC and DoD Sites in Thailand (Knowledge and Materiel Solution)**

The Phase II randomized, placebo-controlled, observer-blinded MAGI clinical trial is designed to evaluate the efficacy of the Bexsero® meningococcal vaccine for protection against gonorrhea infection. Sponsored by NIAID, Division of Microbiology and Infectious Diseases, the trial is a collaborative effort between USU, the Walter Reed National Military Medical Center, the University of Alabama at Birmingham, and GlaxoSmithKline plc. Enrollment in the trial was initiated and will continue through 2022 with a follow-up period of 15 months. It is expected that the DoD sites will provide greater than 50 percent of enrollees in this pivotal trial. If effective, this will be the first vaccine to protect against a common sexually transmitted infection that will improve force health protection and military readiness.

MCCRP

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 (CoE), MCCRP is the nexus of cancer services and support for the MHS with clinical and translational research cancer programs fully integrated with USU, NCI, VA, and other federal and non-federal organizations.

OVERVIEW

Following the Quadruple Aim of the MHS to achieve a high-level of readiness, improved population health, high experience of care, and lower per capita costs, MCCRP was established to manage cancer care for the DoD. It has integrated three congressionally directed translational cancer research programs—

the Center for Prostate Disease Research, GYN Cancer CoE, and the Clinical Breast Cancer Project—and prioritizes additional research on cancers specific to the military populations, occupations, and deployments. MCCRP partners with federal organizations, such as NIH, NCI, VA, DoE, and Pacific Northwest National Laboratory. It has established collaborative relationships with civilian cancer centers, academia, and the pharmaceutical industry.

MCCRP builds upon its success through constant innovation and improvement in its level of research and care. It is imperative that cancer care advances alongside the constantly evolving research field to optimize cancer prevention, diagnosis, treatment, and survivorship. Successful cancer care throughout the MHS is vital, both in terms of providing high-level care for the approximately 1,000 new cancer cases that are diagnosed each year within the U.S. active duty military population as well as in securing a healthy and ready Joint Force capable of facing the complex challenges of the future. As indicated by the Joint Staff-approved ASD(HA) Initial Capabilities Document, the goal for the MHS is that cancer is prevented, screened for, detected, treated, cured, and rehabilitated, or that impacts of cancer and cancer treatment are mitigated so service members are returned to duty, re-classified to a new duty position, or reintegrated into civilian life with highest quality of life. MCCRP cancer educational and clinical research capabilities are designed to support a medically ready force and provide world-class cancer services for the MHS effectively and efficiently.

TOP DELIVERABLES

1 **Applied Proteogenomics Organizational Learning and Outcomes (APOLLO) (Knowledge and Materiel Solution)**

Completed Applied Proteogenomics Organizational Learning and Outcomes (APOLLO) 1 lung adenocarcinoma (LUAD) proteogenomics research project. Systematic analysis of proteogenomic and clinical follow up data identified major alterations, molecular subtypes, and signaling patterns in LUAD tumors that revealed novel proteogenomic determinants of patient survival. MCCRCP detected and then independently validated RNA and protein expression signatures predicting patient survival in LUAD. This proteogenomic characterization provides a new foundation for molecularly informed medicine in lung adenocarcinoma.

2 **Framingham – DoD Framingham Longitudinal Molecular Cancer Program (Knowledge and Materiel Solution)**

DoD Framingham takes blood samples from past and present service members and analyzes their blood proteins with robust mass spectrometry. Spectrometric serum analysis of biomarkers in Oropharyngeal Squamous Cell Carcinoma (OPSCC) of longitudinal samples representing years prior to diagnosis enabled the development of a 13-protein classifier for early detection of OPSCC (2 ± 1 years). The availability of other clinical data will enable further development of proteomic classifiers for predicting clinical outcomes and contribute to the selection of appropriate therapies.

3 **Military Cancer Clinical Trials Network (Knowledge and Materiel Solution)**

Completed the creation of the first federal cancer clinical trials and research network of DoD and VA hospitals, which was begun in 2018 in order to optimize federal resources, enhance cancer research and discoveries, decrease duplication, leverage technologies, enhance intellectual capital, increase education and training opportunities, and improve outcomes for active duty, veterans, and retired service members with cancer. The importance of this network is now in our ability to offer many different types of clinical trials and research opportunities in a coordinated fashion to active duty and veterans with cancer regardless of whether they receive their health care through DoD or VA.

4 **New Formulation of the ERGi-USU Prostate Cancer Inhibitor (Materiel Solution)**

Currently there is no medication for targeting the most prevalent prostate cancer-causing oncogene ERG. Our research has screen-identified a small molecule (ERGi-USU) that selectively inhibits ERG positive cancer cells. Recently, an advanced composition of ERGi-USU with improved anti-cancer activity has been developed. Further, a novel synthesis procedure for the large-scale production of the new compound has been developed. The new ERGi-USU inhibits the growth of prostate cancer cells within the range of FDA approved cancer drugs. Patents have been issued in USA, Japan, Hong Kong, UK, Australia, France, and Germany.

5 **Breast Cancer HER2 Targeted Therapy Optimization (Knowledge and Materiel Solution)**

Studies using frozen OCT-embedded breast tumor specimens showed that gene expression profiles generated by microarray analysis differed between patients with increased HER2 expression due to HER2 gene amplification vs. chromosome 17 polysomy. Due to the limited number of available HER2+ frozen specimens and to better utilize our archived specimens, MCCRCP developed and optimized protocols used with formalin-fixed paraffin-embedded (FFPE) cases. MCCRCP has successfully performed RNA in situ hybridization on FFPE specimens. This technology will make it possible to visualize the localization and heterogeneity of RNA expression within the tumor and influence response to therapy.



NCDMPH

NATIONAL CENTER FOR DISASTER MEDICINE AND PUBLIC HEALTH

DIRECTOR: THOMAS D. KIRSCH, M.D., MPH, FACEP

MISSION

The mission of the National Center for Disaster Medicine and Public Health (NCDMPH) is to improve our nation's disaster health readiness through education and science.

VISION

NCDMPH is dedicated to being the nation's academic center of excellence leading domestic and international disaster health education and research efforts. The focused efforts of NCDMPH span the evolution of best practices in health science, from research to development and deployment. In collaboration with partners across government and in the private sector, NCDMPH creates and translates science and education to improve readiness.

OVERVIEW

The National Center was founded under five federal agency partners: The Department of Health and Human Services (HHS), Department of Defense (DoD), Department of Homeland Security (DHS), Department of Transportation (DOT), and the Department of Veterans Affairs (VA). The National Center, which is both a federal organization and an academic center, is located at USU. NCDMPH serves in the following roles:

- Leads and collaborates with government, private sector, community, and nonprofit partners to advance disaster medicine and public health education and research.
- Acts as a neutral integrator and coordinator across federal, state, tribal, and local governments, academia and non-government associations, and non-governmental organizations.
- Convenes experts from diverse backgrounds to identify disaster health issues and recommend policy solutions.
- Provides consultation to partners within and external to the federal government regarding disaster health education, training, and science.



TOP DELIVERABLES

1 First Aid for Severe Trauma (FAST™) (Knowledge Solution)

NCDMPH's First Aid for Severe Trauma™ (FAST™) program has now taught more than 1,000 people across the United States how to intervene in a bleeding emergency using pressure and tourniquets. FAST is a natural extension of the Stop the Bleed® initiative at NCDMPH and it is the first national Stop the Bleed course designed specifically for high school students. It's about training, equipping, and empowering anyone, especially young people, to help save lives during a bleeding emergency. Half of those trained to date have been high school students, with adults interested in learning how to save lives making up the rest of the FAST graduates, showing the program has wide appeal. So far, FAST has been taught in more than 20 states. The FAST course was launched by the Red Cross in 2021, and thanks to a grant from the Department of Homeland Security Science & Technology Directorate, FAST is available at no cost to high school students under age 19. In November 2021, FAST was honored with a Platinum ASTORS Homeland Security Award. The techniques and Stop the Bleed tourniquet kits have been used, for example, by a teenager who helped a gunshot victim in California, a volunteer EMT aiding a man shot in Maryland, and a school nurse who helped a 9-year-old injured on a playground in Georgia.

2 Best Healthcare Practices in Response to Mass Shooting Workshop (Knowledge Solution)

In collaboration with HHS, DHS, and DOT, the National Center led a Best Healthcare Practices in Response to Mass Shooting study and workshop in September 2021 to better prepare hospitals and emergency medical systems to respond to these tragic events. Clinical experts who responded to shooting events in Orlando, Florida (2016), Las Vegas (2017), Sutherland Springs, Texas (2017), Parkland, Florida (2018), Dayton, Ohio (2019), and El Paso (2019) participated in a consensus building study led by NCDMPH researchers. The key findings from the study will be published as peer-reviewed science and as a guide to best practices for hospitals and the first response community. The workshop was partially funded by DOT.

3 The DoD National Disaster Medical System (NDMS) Pilot Program (Knowledge Solution)

The DoD National Disaster Medical System (NDMS) Pilot Program at NCDMPH advanced its mission of identifying ways to strengthen interoperable NDMS partnerships among public, private, and community healthcare systems with the goal of enabling the highest standard

of definitive care for combat casualties. NCDMPH convened more than 100 interagency, military, and civilian partners in September 2021, in person and virtually, to validate the Pilot's extensive first-year study results. This empowered the Pilot in growing its five-year research efforts by establishing teams at Pilot sites in Denver, Omaha, San Antonio, Sacramento, and in the National Capital Region. The study results are being field-tested and expanded upon, through the collaborative network of NDMS partnerships developed by the Pilot, for the benefit of wounded warfighters and the public at large.

4 Disaster Health Core Curriculum (Knowledge Solution)

The Disaster Health Core Curriculum informs and enhances domestic and international community-level preparedness. Challenges revealed by the COVID-19 pandemic and other disasters continued to drive health professionals to make use of this free resource to elevate their disaster health knowledge and have a direct impact on saving lives. Through an ongoing partnership with the American Public Health Association, more than 700 learners claimed continuing education credits for nurses and physicians in FY 20-21. This course has been applied to components of formal training across the 10 Medical Reserve Corps regions and local units, regional and local health departments, nursing schools, the Centers for Disease Control and Prevention, and Emergency Medical Services programs across the country. Standardized knowledge gained from this curriculum enhances community readiness for disasters nationwide.

5 COVID-19 Webinars (Knowledge Solution)

The COVID-19 pandemic emphasized the need for healthcare coalitions and regional preparedness collaboration to improve our disaster response. Over the past year, the National Center for Disaster Medicine and Public Health hosted five free webinars addressing the response to, and impact of, the COVID-19 pandemic: "New Behavioral Health Tool for the COVID-19 Era"; "Well-being of Underserved Populations during COVID-19 Crisis"; "Well-being of Healthcare Workers during COVID-19 Crisis"; "Collaboration during COVID-19: Healthcare Coalitions and Regional Assistance Committees"; and "The Impact of COVID-19 on Children and Families." These webinars continue to be available on the NCDMPH website. Information presented during the webinars has been useful to participants nationwide in addressing emotional and special population needs during the pandemic.

SC2i

SURGICAL CRITICAL CARE INITIATIVE

DIRECTOR: ERIC ELSTER, M.D., FACS, FRCSENG (HON.), CAPT, MC, USN (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 (see below) 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 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 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 over 2,000 patients with biospecimens as well as an additional 2,900 patients enrolled with data only. It has aggregated over 63 million data elements in its central data repository to power the development of over 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)
- WoundDx™

TOP DELIVERABLES

1 AISE (Materiel Solution)

Data was received from Walter Reed National Military Medical Center, and a CRADA between USU, HJF, DHA, and Lifebell AI, was signed in support of the deployment and subsequent Quality Improvement study. AISE is currently on track for deployment as a CDST utilizing Genesis data with the appropriate software approvals.

AISE will lead to improved outcomes in the early identification and intervention of sepsis in ICU patients. Overall, this will contribute to ICU readiness, improved patient outcomes, and reduced patient care costs, as well as demonstrate a proof-of-concept for data driven tools within the MHS data ecosystem.

2 WoundX™ (Materiel Solution)

The WoundX™ CDST provides the surgeon with a patient-specific probability that a wound will heal normally post-closure. SC2i is working to deliver a machine learning model coupled with a clinical diagnostic assay as an IVD with plans to conduct a FDA clinical trial.

WoundX™ is an important component of wound care because complex extremity injuries are common amongst combat casualties and currently there is no diagnostic that can predict the optimal time for wound closure. This tool will lead to improved clinical care, lower costs across the MHS, and improved resource availability, as well as contribute to medical readiness for future conflicts.

3 Wound Healing Models for DARPA BETR REPAIR Project (Knowledge and Materiel Solution)

SC2i has utilized transcriptomic expression data from tissue biopsy samples of combat casualty extremity wounds to probe differences between healed and failed wounds. From this data, multiple models have been developed showing differences between wounds with different outcomes both in expression of individual genes as well as the amount of coordination within dynamic networks of gene expression, leading to identification of novel genes with importance in wound healing.

This is important as it gives researchers novel targets for therapy and biosensing, thus it allows for advanced modeling and modulation to pro wound healing phenotypes. This will lead to improved outcomes in wound healing.

4 BioBank (Knowledge and Materiel Solution)

SC2i's current biobank includes 63M data elements in its Central Data Repository (CDR) and reflects the

Center's enrollment of over 2,000 patients with bio-specimens and an additional 2,900 patients enrolled with data only. The CDR also represents a vital input/resource for researchers to advance their research interests and develop knowledge products.

The SC2i Bio and Data Bank is accelerating research in the precision medicine field leading to dozens of knowledge and materiel products annually for use by military and civilian surgical care providers around the world. This shared resource is being leveraged by basic to clinical scientists both in military and civilian sectors for novel interrogations of complex trauma related pathophysiologies.

5 Clinical Laboratory Improvement Program (CLIP) Certification (Materiel Solution)

CLIP is the military equivalent of the Clinical Laboratory Improvement Amendments (CLIA) certificate that was created to maintain and regulate safe laboratory testing and ensure the reliability and precision of clinical test results. CLIP requirements include standards for the performance of proficiency testing, quality control, quality assurance, test management, and personnel requirements to monitor, evaluate, and improve clinical testing standards of the laboratory.

CLIP certification will allow SC2i to develop, verify, and validate CDSTs under the highest clinical standards and will be an important prerequisite to obtain FDA approval for these tools. Further, this enables the SC2i laboratories to provide clinically relevant data to physicians in the critical care space.

6 Produced 30+ Knowledge Products (Knowledge Solution)

SC2i has an active research/academic mission and has produced over 30 knowledge products (i.e., abstracts, presentations, posters, publications) over the past year, including releasing papers featured in prestigious academic journals. SC2i also supported approximately 20 medical students (CAPSTONE Program) and surgery residents as part of its medical training (GME) and education (UME) mission.

These knowledge products demonstrate the impactful work the SC2i is doing to advance precision medicine in the surgical care field in line with its mission and vision. This increases the prestige and visibility of military relevant research being conducted within the MHS. Further, SC2i is endeavoring to positively impact the educational experiences of future clinician researchers.

TSCOHS

TRI-SERVICE CENTER FOR ORAL HEALTH STUDIES

DIRECTOR: STEVE MATIS, DDS, MPH, LCDR, DC, USN

MISSION

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

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

VISION

By the end of calendar year 2023, TSCOHS will be widely recognized as the pre-eminent institution within the Department of Defense (DoD) globally supporting the military mission through exceptional dental public health research and education. TSCOHS will support and facilitate uniformed services-related health education and training, research and scholarship, leadership education and training, and national security as it relates to global health.

OVERVIEW

TSCOHS has a military relevance by providing data-driven clinical and population oral health research to support military readiness. Also, TSCOHS staff hold faculty appointments in the USU Postgraduate Dental College and have educational relevance by instructing and mentoring postgraduate dental residents with clinical and public health research as well as providing dental faculty development material. In addition, TSCOHS provides dental subject matter expertise to administer the DoD's assessment of satisfaction of dental care among military beneficiaries, aggregates and analyzes private sector care dental expenditures, and serves as oral health subject matter experts for TRICARE Dental Readiness Source Selection Boards. It is staffed by dental public health dentists who are often the consultants/specialty leaders to their respective services.

TOP DELIVERABLES

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

Completed and distributed monthly ADDP network expenditure reports for all services and the U.S. Coast Guard (total of 48 reports). These reports provide clinic directors and other leaders throughout the MHS with detailed numerical data, user-friendly pivot tables, and interactive graphs demonstrating the referral source and type of expenditure for over \$85 million in annual private sector referral expenditures from 260 dental clinics worldwide, plus an additional \$40 million in remote ADDP Network care, allowing leadership to determine areas where network expenses can be reduced if military treatment facilities capabilities are increased.

2 Direct Support to Five Residents Obtaining Specialty Certificates or USU Master's Degrees (Knowledge Solution)

TSCOHS dental public health specialists provided comprehensive research support for military residents in healthcare specialty programs. The support offered included one-on-one mentorship throughout their research projects, original research ideas, data and/or data analysis, subject matter expertise, abstract and manuscript development, protocol reviews, and IRB-submission guidance. This facilitated completion of requirements for their specialty certificates or USU master's degrees and prepared them to better understand and interpret the scientific literature in their practice as military healthcare specialists.

3 Service Specialty Leaders for Dental Public Health (Knowledge Solution)

TSCOHS staff serve as dental public health specialty leaders for each of their respective services. They advise service leadership on issues pertaining to the specialty, provide guidance to other dental public health specialists within the services and provide career information for dental officers who may be interested in this area of specialization. During 2021, TSCOHS staff evaluated all civilian dental public health training programs in the United States for their suitability to train military dental officers and identified those that are most capable to meet the needs of the services and provide the best return on investment.

4 Subject Matter Expertise for a DHA Sole Source Evaluation Board (Knowledge Solution)

When necessary to support dental readiness, military members may receive care from private sector dental providers. The care is supported by the TRICARE Active-Duty Dental Program (ADDP). When a new contract is needed, the TSCOHS dental staff are often nominated by their respective services to serve as subject matter experts on the Source Selection Evaluation Board (SSEB). In 2021, TSCOHS personnel successfully completed SSEB duties for the follow-on Active-Duty Dental Program, ensuring the services have continued access to a robust network of civilian providers when required to maintain the dental readiness mission of over 1.1 million active duty service members.

5 Integration of DoD Dental Patient Satisfaction Survey Reports with Corporate Dental Systems (Materiel Solution)

The DoD Dental Patient Satisfaction Survey assesses military beneficiary satisfaction with care provided in over 300 military dental treatment facilities (DTFs) worldwide as well as care provided when members are treated in the private sector. In 2021, TSCOHS facilitated a process for all patient comments and numerical survey data metrics to become available for customer service and treatment facility leadership within corporate dental systems. This was a significant upgrade in convenience and data availability for all users and greatly enhanced the military DTFs ability to address and improve customer service.



TSNRP

TRI-SERVICE NURSING RESEARCH PROGRAM

DIRECTOR: HEATHER KING, PH.D., CRNA, CAPT, NC, USN

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

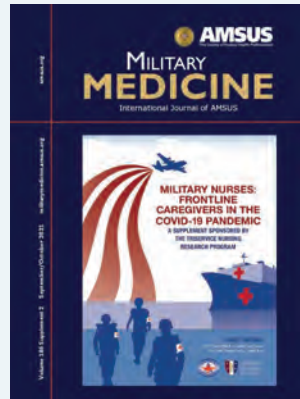
TSNRP is the country's first and only Department of Defense (DoD) program that supports and allows armed forces nurses to conduct military nursing research. TSNRP serves the armed forces military nursing community by awarding grants and offering courses to disseminate nursing research, advance evidence-based practice, and develop future nurse scientist leaders. 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. It fully authorized TSNRP in Public Law 104-106, Sec. 741, Chapter 104 of United States Code Title 10. In addition, Congress 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 been awarded over 500 awards totaling more than \$100 million, resulting in changes to clinical practice, readiness education, and 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 14 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). Military nurses, with support from TSNRP, teach educational courses to strengthen the ability of nurses throughout the DoD to conduct research and implement evidence-based care to improve outcomes for service members and their beneficiaries. Recurring courses include Grant Camp; Writing Workshop; Research and Evidence-Based Practice Dissemination Course; and Evidence-Based Coaching, Leadership, and Practice Courses. TSNRP funds and promotes evidence-based practice at military treatment facilities with projects that improve patient outcomes. The effort has informed the Defense Health Agency Functional Nursing Capability planning process.

TOP DELIVERABLES

1 Military Nurses Frontline Caregivers in the COVID-19 Pandemic (Knowledge Solution)

TSNRP sponsored the “Military Nurses: Frontline Caregivers in the COVID-19 Pandemic” supplement in *Military Medicine*, which included 13 articles featuring the operational and military readiness contributions of military nurses in MTFs and public hospitals. The articles were collaboratively written by senior military nurse scientists and frontline military nurses to rapidly disseminate innovative COVID-19 pandemic nursing care considerations among both the military and civilian healthcare system. Public access available at https://academic.oup.com/milmed/issue/186/Supplement_2



2 Military Women's Health A Delphi Study to Determine Military Women's Health Research Priorities (Knowledge Solution)

This TSNRP funded study conducted by COL (Ret) Lori Trego identified priority areas to research gaps in military women's health, ultimately creating the 2021 Military Women's Health Research Agenda (MWHRA) categories of reproductive health, violence against women, behavioral health, general health promotion, and chronic conditions. A high likelihood exists that the findings of future evidence-based research from the MWHRA will contribute to improving the readiness of women in the military, the training and education of healthcare professionals to care for them, and the ability of the Military Health System to fulfill their health needs.

3 Nurse-Led CBT-I on Service Members with PTSD in a Residential Treatment Facility: Pilot Study (Knowledge Solutions)

This TSNRP funded study conducted by LTC (Ret) Christopher Weidlich explored the feasibility and preliminary effects of a nurse-led intervention of administering Cognitive Behavioral Therapy for Insomnia (CBT-I) to reduce insomnia symptoms. An examination of the sleep metrics shows long-term improvement in sleep and CBT-I administered by registered nurses is effective in improving the sleep quality of service members.

4 Women in Combat Summit

The Women in Combat (WIC) Summit was hosted in February 2021 virtually by TSNRP and USUHS Women's Health Consortium officiated by Col Candy Wilson. The summit covered three themes critical to the successful integration of service women in combat roles: Leadership in the 21st Century, Operational Performance, and Health and Well-Being. The Summit updated findings from the first WIC Summit in 2014 by examining gaps in care, policy, and research for service women in combat roles in support of the National Defense Strategy.

5 TSNRP Promoting Evidence-Based Practice for Health Outcomes of Service Members (Knowledge Solutions)

TSNRP awarded 14 EBP projects to support force health protection of service members and optimal care of beneficiaries. The EBP projects provide evidence-based practice implementation among the healthcare team at nine MTFs to improve patient outcomes by establishing tri-service evidence-based practice councils, implementing guidelines for hospital acquired pressure injuries, nonpharmacological alternatives to manage back pain, and healthcare team training to improve trauma and perioperative emergencies responsiveness.



SimCenter

VAL G. HEMMING SIMULATION CENTER

DIRECTOR: JOSEPH LOPREIATO M.D., MPH, CHSE-A, FSSH, CAPT, MC, USN (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 forefront 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 SimCenter is a research lab currently managing over \$1 million in external grants. The SimCenter is also a test bed for studies in healthcare. 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 DELIVERABLES

1 Clinical Skills Simulation Trainings (Knowledge Solution)

The Clinical Skills team provided over 180 simulation events for over 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 provides 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, which makes it possible 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. This deliverable allows the SimCenter to assess the performance of students after instruction in clinical skills, which makes it possible to better prepare students for clinical duties.

2 Performance Determination and Criteria (Knowledge Solution)

Under a JPC-6 five-year grant, the SimCenter completed its development and analysis of performance in five critical wartime skills: surgical airway; lower leg fasciotomy; lateral vanthotomy 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, SimCenter study results were presented at various national meetings including the Military Health System Research Symposium and the American Society of Ophthalmic Plastic and Reconstructive Surgery Annual Fall Scientific Symposium. This delivered four integrated training packages to JPC-6 for distribution.



3 ChemBio Immersive Team Scenarios (Materiel Solution)

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 training in simulated immersive austere environments. This deliverable enhances warfighter readiness by providing a virtual reality training.

4 AR/VR Wartime Skills Refreshers (Materiel Solution)

With efforts related to the Small Business Innovation Research and Small Business Technology Transfer programs, the SimCenter has participated in developing augmented and virtual reality software applications to refresh critical wartime skills described above. The SimCenter has enhanced 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 its students to refresh their musculoskeletal skills using an intelligent tutor and feedback (SimCoach). This work was performed in collaboration with the Institute for Creative Technologies at the University of Southern California. These deliverables will allow medical professionals to refresh their skill level without the need to return for classroom instruction.





4301 Jones Bridge Road
Bethesda, Maryland 20814

www.usuhs.edu