MISSION

The mission of the Telemedicine and Advanced Technology Research Center is to exploit technical innovations for the benefit of military medicine by developing, demonstrating and integrating across a variety of technology portfolios, including telehealth, medical simulation and training, health IT, medical robotics, command and control, computational biology and mobile solutions. Our mission also includes sponsoring bottom-up innovation through limited technology demonstrations focused on readiness, access to care and health care delivery.

The TATRC fosters research on health informatics, telemedicine/m-Health, medical training systems and computational biology to address gaps in DOD medical research programs and military health care.

Additionally, the TATRC provides telehealth solutions and executive medical research management to enhance and support military health care and promote innovative medical technologies. The TATRC is engaged in essential medical research focused on advanced medical technologies and dedication to bringing innovative telehealth solutions to the Warfighter and the Military Health System. The TATRC explores science and engineering technologies ahead of programmed research, leveraging other programs to maximize benefits to military health care.

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The TATRC is the science and technology scout for military medicine and the center of gravity for the promotion and demonstration of innovative technologies. As a result, the TATRC is a network of experts and capabilities positioned to rapidly address urgent and emerging MHS requirements and operational needs.

Our vision is to be the model of transformational medical research for our Armed Forces and the Nation.

BACKGROUND

The origins of the TATRC can be traced to the early 1990s when the U.S. Army and U.S. Air Force medical departments sought to jointly develop, procure and deploy a filmless medical diagnostic imaging system. By 1993, the Medical Advanced Technology Management Office had been established and identified as the DOD's "Telemedicine Test Bed." In 1998, the MATMO was reorganized and emerged as the TATRC. Since its inception, the TATRC has played a leading role in the development of advanced technologies in the areas of health informatics, medical imaging, mobile computing and remote monitoring, and simulation and training.

In 2010, when CSI research funding ended, the TATRC refocused and streamlined its workforce and footprint to Fort Detrick and Fort Gordon. Also, beginning in July 2014, the TATRC transitioned extramural execution management functions to a consolidated the U.S. Army Medical Research and Materiel Command EM agency and re-engineered focusing solely on intramural laboratory functions. As part of this re-engineering effort, the TATRC identified six core competencies that integrate across five TATRC key laboratories and one core program.

Currently, the TATRC maintains core competencies in the areas of: telehealth, health information technology, medical simulation and training, intelligent medical systems, medical humanitarian assistance/disaster relief communications support and medical technology innovation programs. Twenty-two years after

KEY THEMES AND MESSAGES

The TATRC has consistently provided the enabling technologies that will best support 21st century Army health care. The TATRC has played an important role in championing organizations such as the American Telemedicine Association and has been a leader in areas such as the use of virtual reality tools, biomaterials, and hospital-of-the-future concepts. The TATRC's vision, as an important extension of its legacy, encompasses the creation of opportunities for technology transfer to the public sector as well as the battlefield. By leveraging its partnerships with industry and academia, the TATRC helps make medical care and services more accessible to Warfighters, reduces costs, and enhances the overall quality of health care in wartime and peacetime.

its inception, the TATRC continues to collaborate with numerous universities, commercial enterprises and other federal agencies supporting a multitude of projects. The TATRC's vision, as an important extension of its legacy, encompasses the creation of opportunities for technology transfer to the public sector as well as the battlefield.

The TATRC is an office within the Headquarters of the U.S. Army Medical Research and Materiel Command, located at Fort Detrick, Maryland. The TATRC conducts and supports research through its six key laboratories and programs, which include: Computational Biology, Health I.T., Mobile Health, Medical Modeling and Simulation, Operational Telemedicine and the AAMTI Program. With an extensive network of partners, TATRC expertise is focused on the entire research spectrum, from early stage innovative research to technology demonstrations and implementation to benefit the Warfighter. TATRC labs actively collaborate with commercial entities and academic institutions to address the requirements of our medical research programs through special funding and partnership opportunities.

> *Mobile health technologies provide affordable and practical solutions to medical issues in austere environments, including remote and underserved regions of the world outside of the United States.*

THE TATRC'S LABS AND PROGRAMS

The TATRC performs research to address critical gaps that are underrepresented in DOD medical research programs. There are five major labs and one program that allow the TATRC to manage and address these gaps.

Computational Biology

The purpose of the Biotechnology High Performance Computing Software Applications Institute is to develop computational solutions to accelerate the research and development of militarily relevant medical products for Force Health Protection. The Institute has a multidisciplinary staff with previous working experience in industry, government and academia, and expertise in bioinformatics, computer science, modeling and control, physical chemistry, physics, mathematics, biophysics, biomedical engineering, biochemistry, systems biology, cellular biology, physiology and medicine. Our broad scientific expertise and biological problem-solving skills, coupled with the computational power of the DOD supercomputing assets, provide a unique environment for cutting-edge, computational-experimental interdisciplinary research.

Health IT

The purpose of the Health Technology Innovation Center is to empower government, commercial and academic partnerships to research and develop innovative information technologies that advance military healthcare.

The Health Technology Innovation Center delivers innovative solutions for military medicine by blending health information management and technologies. Health informatics experts conduct applied health IT research in response to MHS capability gaps. This center has the knowledge required to manage the research and development of HIT emerging technologies and carry out product development in a state of the art development environment.

The HTIC also maintains a state-of-the-art development environment to promote research of emerging HIT. This virtualized environment, called the Early Stage Platform for research and development, provides access to multiple electronic record systems for use in designing and developing research projects in a safe environment while mitigating acquisition risk to the enterprise. In house developers with extensive knowledge of AHLTA, VLER, Health Information Exchanges, development standards and current programming environments work on intramural projects and are available to collaborate with outside partners. The ESP supports test versions of Military Health System applications such as: AHLTA, AHLTA Training System, CHCS and various Web services, such as the Patient Ancillary Web Service. The ESP also contains a longitudinal and consistent computer generated synthetic data set that includes 1 million unique patient records.

Mobile Health

The purpose of the Mobile Health Innovation Center is to investigate, demonstrate and evaluate emerging mobile technologies to enhance the quality of life for our Soldiers, Sailors, Airmen and Marines.

The MHIC serves as an innovation center of excellence for evaluating mobile health technologies and networks by providing subject matter expertise and a unique laboratory environment for intramural and extramural research activities in support of Service Members, beneficiaries, patients and Role 1 (first responders) through Role 4 (definitive health care facilities) of the military health care system prior to enterprise-wide deployment.

The TATRC-MHIC is co-located with the Department of Clinical Investigation at Fort Gordon, Georgia. The staff of the TATRC-MHIC is comprised of personnel from a diverse background and included expertise in mobile health, telemedicine, research, program management, case management, clinical information systems, operational medicine, network design, programming and information assurance. The TATRC-MHIC has established partnerships with DDEAMC, the Regional Training Site Medical, the Cyber Center of Excellence Experimentation Division, Georgia Regents University and Augusta Technical College.

Medical Modeling & Simulation

The purpose of the Medical Modeling and Simulation Innovation Center is to serve as an innovative nexus of collaboration, discovery and expertise in medical simulation and training. The MMSIC seeks high value opportunities, such as enabling technologies, visionary concepts and resources. The MMSIC serves as a home to simulation developer resources, such as the BioGears Physiology engine and other open source tools. MMSIC expertise is in high demand with the lab currently funded to assist in medical simulator transition efforts. MMSIC's laboratory research focuses on experimental concepts and novel applications. As such, MMSIC collaborates with forward-thinking research groups to realize this vision.

Operational Telemedicine

The purpose of the Operational Telemedicine Laboratory is to research, prototype and evaluate technical solutions to meet operational gaps in theater health services support and force health protection at or near the tactical edge.

The Operational Telemedicine Laboratory is a robust group of research scientists and technologists from the fields of artificial intelligence, engineering, computer science, telecommunications and robotics, as well as experienced research managers and field operators in combat health services support and Force Health Protection.

The Operational Telemedicine Laboratory is focused on five primary areas of research:

> "
> *The Operational Telemedicine Laboratory is a robust group of research scientists and technologists*
> "

- **Robotics and Knowledge Engineering** focuses on integrating and prototyping robotic and unmanned technologies and medical intelligent systems in order to provide standoff and remotely operated capabilities for combat casualty care, operational medicine and force health protection. This area also researches and prototypes robotic enablers for applications in other convergent scientific domains.
- **Tactical Edge Medical Information Exchange and Telemedicine** focuses on prototyping lightweight ruggedized technologies for physiological monitoring, telemetry, medical imaging, voice, video and electronic data exchange and integrating with SMART devices and tactical communications.
- **Biomonitoring, Diagnostic & Treatment Technologies** focuses on technologies for improving health outcomes through the development of sensors, diagnostic tools and treatment technologies for use in deployed environments and remote locations away from medical facilities and/or trained medical providers.

- **Special Operations Medical Technology** focuses on integrating and applying technologies from the other three research execution areas of this scientific domain to support the most extreme remote aspects and unique challenges of special operations missions.
- **Medical Command and Control Communications** focuses on evaluating, demonstrating and training communication capabilities intended for non-standard medical augmentation deployment scenarios in homeland defense, humanitarian relief, civil support and foreign consequence management missions. Special focus areas include portable satellite-based communication platforms, mobile devices and other systems which operate in a no or low-infrastructure environment and can be maintained by organic medical personnel with minimal training.

AAMTI

The purpose of the AMEDD Advanced Medical Technology Initiative is to identify, explore and demonstrate key technologies and enable biomedical principles required to overcome technological barriers that are medically and militarily unique.

The fundamental goals of the AMEDD Advanced Medical Technology Initiative are to demonstrate advanced medical technologies and their impact on cost, access, quality and safety of care and medical readiness; to provide senior AMEDD leadership with medical "tech-watch" capabilities; and to encourage medical technology entrepreneurship by funding MEDCOM technology innovators through a bottom-up (provider MTF level) approach.

The results of AAMTI demonstration projects are expected to either directly result in, or support, efforts to:

– Provide technologies needed to enhance full spectrum Force Health Protection and readiness;

– Reduce the cost of delivering care;

– Reduce the time it takes to access care and critical specialty intervention;

– Improve the skills and efficiency of care providers; and

– Improve the quality and safety of care throughout the TRICARE health care continuum.

AAMTI-funded projects leverage and/or demonstrate primarily Commercial-off-the-Shelf and emerging technologies and systems, some of which evolved from projects funded through Congressional Special Interest, Small Business Innovative Research, Defense Health Program, core medical research programs and other DOD and Government sources. AAMTI projects inform technology transfer efforts by providing data and information to enable smarter acquisition decisions that positively affect the enterprise.

QUESTIONS & ANSWERS

Q *Why does the USAMRMC need an organization like the TATRC?*

A The TATRC's main priority is addressing medical related technology and knowledge gaps and requirements by conducting research that can transition to program offices and ultimately make a difference for our Soldiers. This type of research is needed across the USAMRMC and throughout the Military Health System.

The TATRC's focus is best articulated in our mission statement, 'Exploit technical innovations for the benefit of military medicine by developing, demonstrating and integrating across a variety of technology portfolios including telehealth, medical simulation and training, health IT, medical robotics, command and control, and mobile solutions. Sponsor bottom-up innovation through limited technology demonstrations focused on readiness, access to care and health care delivery.'

Q *What emerging technologies does the TATRC bring to the USAMRMC?*

A The TATRC provides the only medical computational biology expertise within the DOD, led by the Biotechnology High Performance Computing Software Applications Institute. The BHSAI conducts research across a spectrum of important capabilities; ranging from network science and high-performance computing applications to development of multiscale models and medical decision support algorithms. Two large areas of focus include vaccine research and big data analysis.

Additionally, the TATRC is involved in the following emerging technologies: mobile devices/apps for the operational environments, internet of things, biosensor/body area networks, mobile device capabilities in home health, medical robotics, unmanned systems, autonomous devices, simulation-based training technologies and telehealth.

> *The TATRC provides the only medical computational biology expertise within the DOD, led by the Biotechnology High Performance Computing Software Applications Institute.*

Q *Who are TATRC's customers?*

A TATRC's customers include DOD program offices; Joint Program Committees; other DOD entities; and researchers and research users, as well as outside scientists and entrepreneurs with potential solutions that can address DOD needs. To this end, the TATRC plays a key role in connecting those with relevant problems (gaps and requirements) to those with the potential solutions to the problem. The TATRC is one of the IM/IT research laboratories for the Joint Medical Information and Medical Modeling and Simulation.

Q *What has the TATRC done for our Service Members?*

A The TATRC established the Theater Tele-Behavioral Health Demonstration Project in 2009, which remains in operation today. This program allows Soldiers far forward on the battlefields to connect with behavioral health providers 24/7. Over 70% of the Soldiers surveyed stated they would not have sought behavioral health care if this program did not exist.

Established a cell phone bi-directional, secure capability between Soldiers and their case managers and platoon sergeants in five Community Based Warrior Transition Units (each supporting close to 200 Soldiers throughout five states). Published research has shown that this program increased communications between the Soldiers and their case managers and platoon sergeants, and shortened their stay in the CBWTU.

Established an email teleconsultation program, which has resulted in the following: 20 specialties with contact groups; 13,123 teleconsultations (April 2004 to November 2015); 214 known evacuations prevented; 645 known evacuations facilitated; 3,283 different referring providers; 1,308 teleconsultations on non-US patients; maintained a response time of around five hours; and included all U.S. military services and some NATO partners.

Has been the lead DOD organization focused on operational environment research and coordinating this research internally from Role 1 through Role 4.

Q *What are some of the TATRC's accomplishments?*

A The TATRC transformed from an Execution Management Agency to intramural DOD lab and currently has greater than 40 active funded research projects. Additionally, The TATRC received ATOs for three of its' labs (MHIC, OpTMed and HTIC); completed a User Needs Assessment, CONOPS and Pre Evaluation Plan for the Advanced Modular Manikin; obtained synthetic data that will greatly reduce HIPPA and other related violations and enhance the ability to further research; created the abilities for the Early Stage Platform to assess the research environment at the ABL in West Virginia for connectivity to the DHMSM EHR Solution, Cerner and the legacy record systems; developed, validated and deployed the APPRAISE (Automated Processing of the Physiological Registry for Assessment of Injury Severity); and developed a mathematical method to identify new diseases for existing FDA approved drugs.

Developed the mCare mobile app to connect injured warriors with their caseworkers at the Community Based Warrior Transition Units utilizing the Soldiers' personal cell phones for bi-directional HIPAA-compliant messaging managed by a central, secure web portal and system. The system has already been used to send more than 138,000 secure messages reminding patients of appointments and disseminate administrative, health and wellness information and assisting case manager information management and real-time alerts for critical issues. mCare was recognized as one of the Army's greatest inventions of 2010.

Furthermore, TATRC's Operational Medicine laboratory led the way in the following areas:

- **Completion of airworthiness & aerial network certification,** installation and operation of Brigade Combat Team Terrestrial RT2033 Wideband Network Waveform radio on rotary wing aircraft with successful transmission of telemedicine information (waveform telemetry, voice over IP, video, still imaging and TCCC DD1380 medical records) to ground medical treatment facilities.

- **Completion and field testing** of working Cross Domain Solution for transfer of electronic TCCC Card/DD1380 from SIPRNET to NIPRNET for uploading to AHLTA-T.

- **First ever implementation of military mobile 4G LTE cellular base station** on Aerostat Persistent Ground Surveillance System for proving telemedicine and medical information exchange range extension via airborne mobile 4G LTE MACE (multiple Access Cellular Extension) base station.

- **Ultra Wide Band transmission of physiological monitoring data** from patient worn monitors to DD1380 eTCCC card on Medics End User Device and further transmission of DD1380 to ground and air evacuation platforms via long-range UWB.

- **Transition of SBIR work from Piasecki Combat Medic UAV** for Medical Resupply and CASEVAC SBIR to DARPA ARES (Aerial Reconfigurable Embedded System) project.

- **Transition of SBIR work** from Kutta and Neya Systems for Command and Control of Medical UAV for CASEVAC to Navy AACUS (Autonomous Air Cargo Unmanned System) Program and OSD/NAVAIR UCS (Unmanned Control System) Program.

> *mCare has already been used to send more than 138,000 secure messages reminding patients of appointments and disseminate administrative, health and wellness information and assisting case manager information management and real-time alerts for critical issues.*

Lastly, the TATRC formalized working relations by developing Memorandums of Agreements with PEO-STRI and PEO-MC4, and has others pending with program offices such as, JPEO-ChemBio, Marines and SOCOM. The goal is to focus our research on identified gaps and requirements and to facilitate the transition of our research solutions to program offices, thus improving the likelihood of getting our solutions into the hands of Soldiers.

Q *Where can I find more information about the TATRC?*

A For more information about the TATRC and its key labs and initiatives, please visit us online at: *www.tatrc.org*; "like us" on Facebook; "follow us" on Twitter; or call the TATRC Public Affairs Office at (301) 619-7927.