



## General “Mike” Murray Tours USAMRDC and TATRC



MISL Lab’s Nathan Fisher (*Right*) briefs and highlights the research and development taking place in the field of medical robotics and unmanned systems to AFC Commander, General John Murray (*3rd from left*) during a VIP tour.

On 26 February, the U.S. Army Medical Research and Development Command (USAMRDC) had the privilege and honor of hosting General John “Mike” Murray, AFC Commander, for a demonstration, tour, and briefing of the Command, which included TATRC as one of the highlighted participants.

TATRC’s Medical Intelligent Systems Lab (MISL) was front and center to discuss the initiatives and advances taking place in the area of autonomous systems. There to brief the General on the various facets of MISL’s work in this field was Project Manager, Mr. Nathan Fisher.

General Murray was extremely interested and engaged in this forward-thinking future technology.

John M. “Mike” Murray is a United States Army General, the first Commanding General of U.S. Army Futures Command (AFC), a new four-star Army Command (ACOM) headquartered in downtown Austin TX under which USAMRDC now falls. General Murray was previously the G-8, deputy chief of staff to the Army Chief of Staff (CSA). He served as principal advisor to the CSA for materiel requirements, as military counterpart to the Assistant Secretary of the Army for acquisition, logistics, and technology (ASA(ALT)). Modernization reform is the focus of AFC, which means readiness for a nearer-term future.

TATRC was honored to be part of the visit with such an esteemed group of individuals within the Command, but especially grateful for the opportunity to have direct dialogue with General Murray! ■■■

### IN THIS ISSUE:

#### GENERAL MURRAY TOURS

USAMRDC & TATRC..... PAGE 1

TEAM TATRC AMONG THE LARGEST CROWD YET TO GATHER AT THE IMSH CONFERENCE ..... PAGE 2

TATRC LAUNCHES NEW REMOTE HOME MONITORING (RHM) PROJECT WITH THE BAMC VIRTUAL MEDICAL CENTER AND WALTER REED ..... PAGE 3

BHSAI USES ARTIFICIAL INTELLIGENCE (AI) METHODS TO ASSESS VACCINE-INDUCED IMMUNE RESPONSES ..... PAGE 4

FOB OT3S / FOXTROT: A NEW COLLABORATIVE EFFORT BETWEEN TATRC’S MHIC AND 59TH MEDICAL WING SCIENCE & TECHNOLOGY OFFICE..... PAGE 5

THE ADVANCED VIRTUAL SUPPORT FOR OPERATIONAL FORCES (ADVISOR) SYSTEM ..... PAGE 6

RETIREMENT OF MS. ESMILDA “ANGIE” HILL..... PAGE 10

MHIC WELCOMES NEW IT SYSTEM ADMINISTRATOR TO THE FT. GORDON OFFICE..... PAGE 10

EMPLOYEE OF THE QUARTER, MS. STEPHANIE EDWARDS ..... PAGE 11

TATRC TRIVIA ..... PAGE 11

AAMTI PROJECT SPOTLIGHT: USING WEARABLE SLEEP MONITORS TO IMPROVE BEHAVIORAL HEALTH CARE OF SERVICE MEMBERS’ FAMILIES: A CLINICAL QUALITY IMPROVEMENT PROJECT..... PAGE 12

AAMTI PROJECT SPOTLIGHT: ONLINE COGNITIVE-BEHAVIORAL TREATMENT FOR INSOMNIA (OCBT-I) IN THE PRIMARY CARE SETTING: AN EFFICACY AND FEASIBILITY STUDY..... PAGE 13

MMSV LAB COLLECTS KEY DATA IN AUGMENTED REALITY FORWARD SURGICAL CARE CAPSTONE EVENT ..... PAGE 15

MHIC RECEIVES FULL AUTHORITY TO OPERATE (ATO) FOR THE MHCE-R / MCARE SYSTEM ..... PAGE 16

LET’S GET SOCIAL ..... PAGE 16

ON THE HORIZON ..... PAGE 16

## Team TATRC Among the Largest Crowd Yet to Gather at the IMSH Conference!



MMSIV Lab Lead, Mr. Geoff Miller, demonstrates a simulated escharotomy procedure to conference attendees.

It was a big week for Team TATRC in late January as they traveled to San Antonio, TX to participate in the International Meeting for Simulation in Healthcare (IMSH). The theme for the 2019 IMSH Conference was “Redefining & Redesigning Healthcare Powered by Simulation,” and the Society for Simulation in Healthcare’s (SSH) annual event set an attendance record with over 3,000 participants and 800 vendors in the Exhibit Hall, with TATRC being one of them in the Government Row section. This scientific conference explores the latest innovations and best practices in healthcare simulation. IMSH provides the tools and resources healthcare professionals need to advance their skills, impact change in delivery systems and practice, and, ultimately, to improve patient safety. As the world’s largest conference dedicated to healthcare simulation learning and research, this event is always a keystone for TATRC!

Mr. Geoff Miller, Lab Manager of TATRC’s Medical Modeling, Simulation and Visualization Lab (MMSV), led the team, accompanied by Ms. Ollie Gray, Mr. Carl Manemeit, Ms. Lori DeBernardis, and Mr. James Gaudaen.

TATRC hosted a booth in Government Row within the main exhibit hall where we directly interfaced with industry leaders and our federal partners, and had a meaningful one-on-one dialogue with conference participants. Mr. Miller gave a whole new meaning to the term ‘break a leg’ as he demonstrated a simulation of an escharotomy procedure! The booth also attracted Retired 3-star General, visionary, and former Army Surgeon General, Ron Blanck MD, who paid a



Mr. Carl Manemeit, Ms. Ollie Gray, Ms. Lori DeBernardis, and Mr. James Gaudaen directly interfaced with industry leaders and our federal partners in the exhibit hall at IMSH 2019.



Former Army Surgeon General, LTG(R) Ron Blanck MD (Left) visited TATRC’s booth to talk technology and innovation.

visit to the staff to talk technology and innovation!

During the conference, the SSH, led by current President, Joe Lopreiato MD, inducted a new group of Fellows into the society during the President’s Diamond Ball. Among the 11 distinguished individuals was our very own Geoffrey Miller.

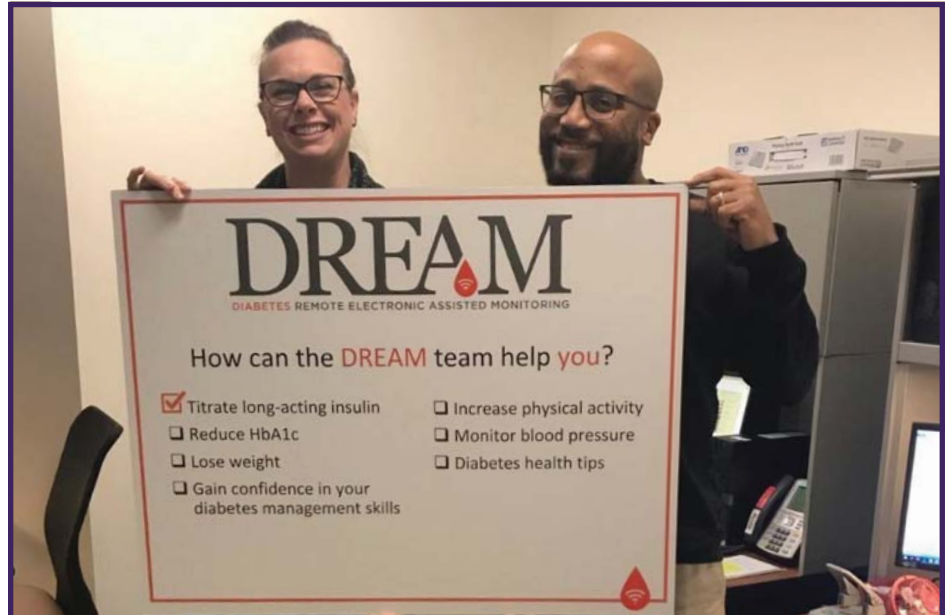
The best part about this great conference is that TATRC is looking forward to shaping the program and actively participating again next year! Thank you to all attendees, partners, and staff who made IMSH 2019 a resounding success! TATRC was honored, as always, to be able to exhibit the great work being done in our organization, and to experience firsthand the work of those around us helping to pioneer the industry! Here’s to IMSH 2020! ■■■



# TATRC launches New Remote Home Monitoring (RHM) Project with the BAMC Virtual Medical Center and Walter Reed

This Spring, members of TATRC's Mobile Health Innovation Center (mHIC), visited both the Army's Virtual Medical Center within Brooke Army Medical Center (BAMC), in San Antonio, TX and Walter Reed National Military Medical Center (WRNMMC). Led by mHIC's Lab Manager, Ms. Jeanette Little, Ms. Tabitha Waldrop, and Mr. Nate Montgomery conducted face-to-face training for the Diabetes Remote Electronic Assisted Monitoring (DREAM) Team at BAMC on the use of the Mobile Health Care Environment (MHCE) system and secure mobile app, mCare, for remote home monitoring of patients selected to participate in the DREAM Project. mHIC Nurse, Mabel Cooper, and Help Desk Analyst, Matt Goff, led the training event at WRNMMC.

Ms. Jeanette Little stated, "Partnering with LTC Jennifer Stowe, Deputy for



Kim Wasmuth and Delvon McDaniel, DREAM Team Members at the Diabetes Center of Excellence (DCOE), JBSA-Lackland, San Antonio, TX.

**JENNIFER STOWE** • 1st OD, LSSBB, MBA, MHA, FFAO, FACHE, Winner of MEDCOM Project of the Year 2017, DHA... 2mo

Project DREAM (Diabetes Remote Electronic Assisted Monitoring) works in using Remote Health Monitoring to get patients to BG goal fast! #SUCCESS #kesselrun

This project could not work without our DREAMERS! Jana Wardian Gina Domis Daniel Yourk MSN, MHA, FACHE Sean Hipp Lea Beilman Patrick Arida Valerie Riege Tabitha Waldrop, PMP, PHR A. Rebecca Ontiveros Christopher Stice

**DREAM Average Fasting Glucose**

LTC Jennifer Stowe, DREAM Project Manager, partnered with Diabetes Center of Excellence (DCOE), JBSA-Lackland, San Antonio and WRNMC. Graphic above shows the immediate results were realized upon implementation of DREAM.

Administration at the Army Virtual Medical Center, the DREAM Project is a first of its kind, AND one of the first projects to launch for the Army Virtual Medical Center. The dynamic partnership between TATRC's mHIC and LTC Stowe's DREAM Team has fostered a cutting-edge, real-time approach to Remote Health Monitoring (RHM) to enable diabetics and their provider teams to tenaciously follow glucose readings, observe weight and blood pressure trends at-a-glance, and proactively follow nutrition and fitness progress."

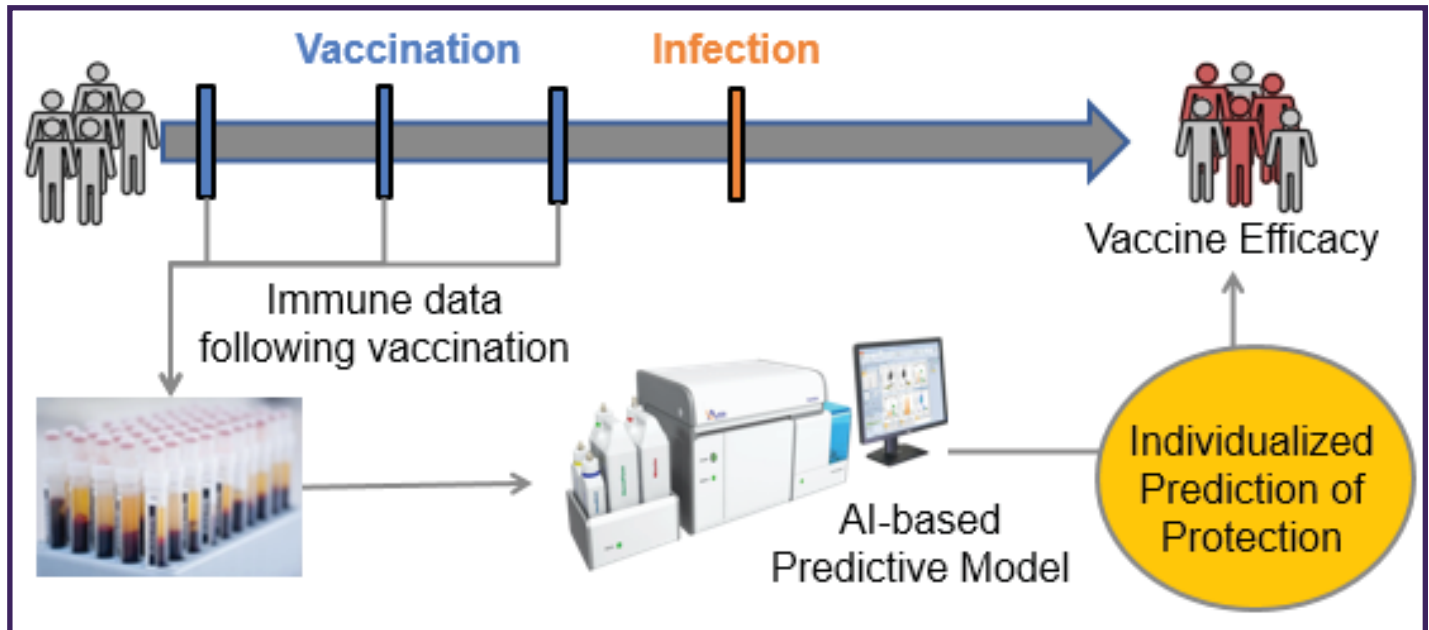
This training event focused on LTC Stowe's team, currently comprised of a research director, registered nurse and a diabetes educator. The hands-on training covered the step-by-step process for enrolling patients in the website, connecting and operating patients' Bluetooth health data recording devices to the mobile app, monitoring patients remotely through the MHCE system, and tips and techniques for success.

mHIC's mCare app was identified by

the MHS Virtual Health RHM Sub-Working Group as a secure connectivity solution to enable remote monitoring of a patient's Bluetooth glucose and activity monitors securely through their personal smartphone. The overall impact of 1) health tips that are intentionally and systematically delivered, 2) alerts that are auto generated just-in-time based on individualized parameters; and 3) direct messages from provider teams is a vigilant approach to patients on the path to a more prudent lifestyle for improved health, and a provider team that conducts individualized treatment for enhanced successful patient outcomes.

The DREAM Project is innovative, and impactful, and the results have been immediate! Within the first seven weeks of launching, all patients enrolled in the DREAM project recorded glucose readings within their defined ranges. Some of the original research in this project dates back to an AAMTI funded endocrinology project, also managed by TATRC's mHIC team. ■■■

## BHSAI Uses Artificial Intelligence (AI) Methods to Assess Vaccine-Induced Immune Responses



During a vaccine clinical trial, immunological data are collected at several time points following vaccination, prior to infection. Data from each subject are then fed into an AI-based model to make an individualized prediction of protection, which is compared with the clinically observed protection status of that subject. An accurate predictive model can be used to determine what combination of immune responses is most responsible for protection, providing a basis for guiding future vaccine design efforts.

Vaccines are an essential component of Force Health Protection, particularly for Service members deployed overseas where they may be exposed to infectious diseases, such as malaria and dengue fever, or newly emergent outbreaks, such as Ebola or Zika virus. The Walter Reed Army Institute of Research (WRAIR) and the United States Army Research Institute of Infectious Diseases (USAMRIID) have long formed the backbone of the U.S. Army's vaccine development capabilities, carrying out pre-clinical studies and clinical trials that measure vaccine-induced immune responses and assess vaccine efficacy.

Recent advances in immune assay technologies, from next-generation sequencing to multiplex flow cytometry, enable clinicians and immunologists at WRAIR and USAMRIID to measure highly complex immune responses in

vaccine clinical trials at an unprecedented level of detail. However, the large data sets produced by these technologies pose significant challenges of their own: How do we translate this new 'big data' in immunology into actionable information on how vaccines work or fail?

Scientists from TATRC's Biotechnology High Performance Computing Software Applications Institute (BHSAI), led by Dr. Jaques Reifman, recently tackled this problem with collaborators at WRAIR. Together they sought to determine whether Artificial Intelligence (AI)-based models could rapidly process immunological data from clinical studies to identify what combination of immune responses is responsible for protection. Isolating these protective responses, also known as correlates of protection, can help researchers improve existing vaccines or design new ones with increased efficacy.

Under the Military Infectious Diseases Research Program, Dr. Sid Chaudhury, a staff scientist at BHSAI, developed a computational method to integrate large immune data sets that capture antibody, cellular, and cytokine responses across a wide range of assays, and then applied AI to make individualized predictions of protection from the immune data. At an individual level, this AI-based model enables scientists to determine why the vaccination succeeded or failed to achieve protection for a given subject in a clinical trial. At a study level, this AI-based model can help determine what combination of immune factors is necessary to achieve protection.

Dr. Chaudhury worked with Dr. Elke Bergmann-Leitner, Chief of the Flow Cytometry Center at WRAIR, to analyze data collected at WRAIR

***AI Methods to Assess***  
*continued to page 5*





## FOB OT3S / FOXTROT: A New Collaborative Effort between TATRC's mHIC and 59th Medical Wing Science & Technology Office

TATRC's Mobile Health Innovation Center (mHIC) launched a new research effort with the U.S. Air Force this past March. This joint effort is in partnership with the 59th Medical Wing Science & Technology (59 MDW/ST) Chief Scientist's Office, which is a novel collaboration for TATRC to date. The research effort, entitled Forward Operating Base Ocular Trauma Telemedicine Triage and Stabilization (FOB OT3S), was submitted by MAJ Gensheimer from Joint Base Andrews in collaboration with mHIC.

### There are five specific objectives of this research effort:

1. Evaluating and testing of image acquisition devices and communications devices for use in military teleophthalmology
2. Develop a new, secure mobile teleophthalmology application (App), utilizing mHIC's Mobile Health Care Environment-Research (MHCE-R) system, called FOXTROT, a teleophthalmology mApp specifically designed for ocular trauma.
3. Develop a standardized and reproducible protocol for utilizing teleophthalmology.
4. Assess the cyber and data security of teleophthalmology devices.
5. Create a teleophthalmology training program for military ophthalmologists.

This research effort specifically addresses limited access to ophthalmic care at forward operating bases by designing resources for Teleophthalmology support. It has been noted that during Operation Iraqi Freedom and Operation Enduring Freedom, 10-15% of combat-related trauma injuries involved the eye. mHIC's Clinical Research Project Manager, Ms. Amanda Schmeltz, stated, "FOXTROT will give the provider at the point of injury



mHIC partners with the U.S. Air Force 59th Medical Wing Science & Technology (59 MDW/ST) Chief Scientist's Office in a new research effort entitled Forward Operating Base Ocular Trauma Telemedicine Triage and Stabilization (FOB OT3S)

an ophthalmologist specialist in their ear. This project represents the capability to push far more specialty-specific expertise to the tactical edge of the battlefield than ever before."

Currently, this project is in its early planning phases, but will formally begin this summer with a kick off meeting of subject matter experts from the Air Force and Army at mHIC. An OCONUS proof of concept is being planned to coincide with the deployment of Ophthalmologist and Principal Investigator, Dr. (MAJ) William Gensheimer later this year. ■■■

## AI Methods to Assess

*continued from page 4*

on a recent vaccine study in which non-human primates were immunized with a new Army-developed malaria vaccine candidate—the Self Assembling Nano Particle—using different adjuvants. (Adjuvants act as powerful immunostimulators to modify and enhance vaccine-induced immune responses.) In research recently published in the journal 'Scientific Reports,' Dr.

Chaudhury used AI to determine how these different adjuvants alter vaccine-induced immunity, providing a basis for rationally selecting adjuvants to maximize vaccine efficacy.

By bringing together the capabilities of complex immunoprofiling at WRAIR's Flow Cytometry Center and AI-based modeling at BHSI, Dr. Chaudhury and Dr. Bergmann-Leitner have identified potential correlates of protection in clinical trials carried out at WRAIR and at the Naval Medical Research Center for

a range of malaria vaccines, including the RTS,S (Mosquirix™, GSK Inc.), PfSPZ (Sanaria Inc.), irradiated sporozoite (U.S. Navy), and FMP2.1 (U.S. Army) vaccines.

Dr. Sid Chaudhury stated, "The ability of AI to integrate the large immunological data sets and provide key biological insights underscores its potential to revolutionize infectious disease research, from vaccine design to disease surveillance." ■■■

## The ADvanced Virtual Support for Operational Forces (ADVISOR) System

The project previously known as the ADvance Virtual Support for Special Operations (ADVISSOR) is an AMEDD Advanced Medical Technology Initiative (AAMTI) funded effort that has just completed. The ADVISSOR project built upon and expanded a previous AAMTI funded effort, the Virtual Critical Care Consultation (VC3) Service (Powel 2017). This AAMTI project facilitated collaboration between the U.S. Army Institute of Surgical Research (USAISR) and the 3rd Special Forces Group (3SFG) to develop the techniques, tactics, and procedures (TTPs) that would enable the VC3 service to deliver advanced critical care consultation to Special Operations Forces (SOF) medics at anytime, anywhere using low cost, low technology, highly reliable solutions. The system utilized ubiquitous technology: a call roster for critical care physicians at the Brook Army Medical Center (BAMC) and a call forwarding system to connect SOF medics with intensivists using a single phone number. Callers were encouraged to send images and/or background information devoid of personally identifiable information and operationally sensitive information to an e-mail distribution list of VC3 intensivists prior to calling.

Unfortunately, the original design was less than reliable because the call forwarding system was a desktop phone with a call forwarding feature (Figure 1). The ADVISSOR project sought to enhance the system's reliability and to further expand access to other specialties besides



*Figure 1. Special Operations Medical Sergeant caring for a simulated critically ill trauma patient during the Mountain Path prolonged field care training exercise. Using the Virtual Critical Care Consultation (VC3) call guide, the medic, if able, first sends images of the casualty, care documentation flow sheets, and available equipment via e-mail to the VC3 distribution list and then calls the VC3 phone number which forwards to the on call VC3 intensivist who provides consultation.*

critical care for the dislocated medic caring for patients in austere settings. ADVISSOR purchased an automated call distribution (ACD) system license and funded a project coordinator (PC) to help facilitate call schedules and data collection. The PC also helped develop and coordinate training for the new clinicians from other specialties that were to start taking calls.

The ACD system was custom designed to allow calls to automatically “switch” between a primary on-call physician, then to a back-up on-call physician in the event that the primary physician did not answer the call (usually due to other clinical engagement [i.e. in an operation or procedure] or bad cellular service), and ultimately to a continuously staffed emergency department. This

system, following some initial technical difficulties related to the custom programming, ensured that all calls were answered. The ADVISSOR project further developed TTPs learned through the VC3 effort into a Standard Operating Procedure for how to engage consultants for routine, urgent, and emergent consultations and unified other operational virtual health (OVH) capabilities under one system, now called ADVISOR (ADVanced Virtual Support for Operational forces) (Figure 2). In this system, OVH support capability is determined by operational context: routine care, urgent care, or emergent care (Table 1). Not pictured is the concept of “direct patient care,” vice consultative

**ADVISOR** continued to page 7



**ADVISOR** continued from page 6

care. Direct patient care by a remote provider requires additional technology support and assurances for patient safety because there is potential that this care may be provided in lieu of having a local caregiver supporting the patient. The ADVISOR system is a consultative OVH capability only; although, use of the ADVISOR system may enable direct patient care and any call may be escalated to use more advanced technologies like video teleconferencing (VTC) and remote physical exam equipment if/when network resources permit.

The initial call system for ADVISOR included call rosters for critical care, general surgery, orthopedic surgery, infectious disease and dermatology. After the first six months of use, there were no calls for dermatology despite a high volume of asynchronous dermatology consultation using the AKO e-mail system, the Pacific Asynchronous TeleHealth Portal (PATH) and the Health Experts online Portal (HELP). The dermatology call roster was switched to toxicology. Over the next six months, additional call service lines

were added for pediatrics, the U.S. Army Burn Center, and veterinary services. Thus far, the system has supported over 130 training calls and 40 real world consultations in its first 18 months of usage with call volume steadily increasing over the past twelve months (Figures 3 & 4). The majority of calls in the first 12 months of service were from AFRICOM representing 3SFG area of operation (AOR); whereas, in the last six months of service, call volume has shifted to the CENTCOM AOR (data not shown). Estimated savings



ADVISOR continued to page 8





## ADVISOR continued from page 7

AD•VI•S•OR			Other Capabilities
Emergent	Urgent	Routine	Direct Care
<ul style="list-style-type: none"> <li>• Consult within minutes</li> <li>• Life threatening or potentially life threatening conditions like:                             <ul style="list-style-type: none"> <li>○ Shock</li> <li>○ Respiratory failure</li> <li>○ Renal failure</li> <li>○ Liver failure</li> <li>○ Complex wounds</li> <li>○ Polytrauma</li> <li>○ Burns</li> <li>○ Severe infection/sepsis</li> <li>○ Crush injuries</li> <li>○ Severe electrolyte abnormalities</li> <li>○ Encephalopathy/severe TBI</li> <li>○ Abnormal vital signs</li> <li>○ Complex arrhythmias.</li> </ul> </li> <li>• Poisonings</li> </ul>	<ul style="list-style-type: none"> <li>• Consult within minutes</li> <li>• Urgent consults are all other cases that do not fall under the routine or emergent categories.</li> <li>• Urgent consults usually require specialty medical advice (i.e. general surgery, orthopedic surgery, infectious disease, toxicology, pediatrics, behavioral health, burn care, etc.) and would benefit for synchronous communication between the local caregiver and the remote consultant.</li> </ul>	<ul style="list-style-type: none"> <li>• Response within 24 hours.</li> <li>• NORMAL vital signs</li> <li>• Not going to deteriorate in 24hrs</li> </ul>	<ul style="list-style-type: none"> <li>• It must always be planned ahead of time</li> <li>• Direct patient care is NOT teleconsultation.</li> <li>• DC uses VTC to evaluate and treat patients who are in a different location.</li> </ul>

**Table 1. Categories of care for Operational Virtual Health Support Capabilities. The ADvanced Virtual Support for OPeRational forces enables expert consultation at the point of need. Other solutions exist for direct patient care.**

for the synchronous component of ADVISOR based on evacuation avoidance for only 6 real world cases was approximately \$250,000. Thus the return on investment for this project far exceeded the AAMTI funding level of less than \$200,000.

Notable challenges remain for the ADVISOR system. These include: knocking down tactical-to-garrison network barriers; gaining knowledge about when to employ the appropriate level of technology for a given clinical scenario; clearly identifying network resources required to support various technology solutions; process development to facilitate flexible switching between telephone only calls and VTC supported calls when needed; adding multipoint/tele-conferencing capabilities to support better situational awareness of the medical chain of command during remote consultations; developing cross region staffing models for the on-call system; and completing the integration of ADVISOR with the Joint Tele Critical Care Network in order to enable continuous, real-time consultative support from the point-of-injury through definitive care. Effective PACE planning (primary, alternate, contingency, and emergency) is crucial for the successful use of telemedicine to support real patient care. The primary plan should be to train and deploy the appropriate resources to care for the anticipated casualty burden. In the absence of the required resources (personnel, equipment, medications, diagnostics,

**Table 2. Best practices for operational Virtual Health support**

- Telemedicine consultation is a skill. Local caregivers and remote consultants must train to sustain this skill.
- **Prepare** to use telemedicine by training with the telemedicine system you will use on deployment. Have a PACE plan.
- **Recognize** when to make the call: better to “call early and call often”
- **Execute** the consultation.
  1. Use a telemedicine script to be efficient and complete.
  2. Send background information asynchronously before calling.\*
  3. Use closed loop communication.
  4. The remote consultant should document the encounter and send recommendations to the local caregiver using text or e-mail.
- **Problem Solve** technical challenges. Do not use technology that you do not need (i.e. do not use VTC when phone call is sufficient and do not use e-mail alone to ask questions about a critically ill patient. Practice using the technology during training so that you can problem solve more efficiently.

\*All images should be cleaned of personally identifiable information or encrypted before sending and should be thoroughly scrutinized for operational security (OPSEC) purposes.

**ADVISOR** continued to page 9





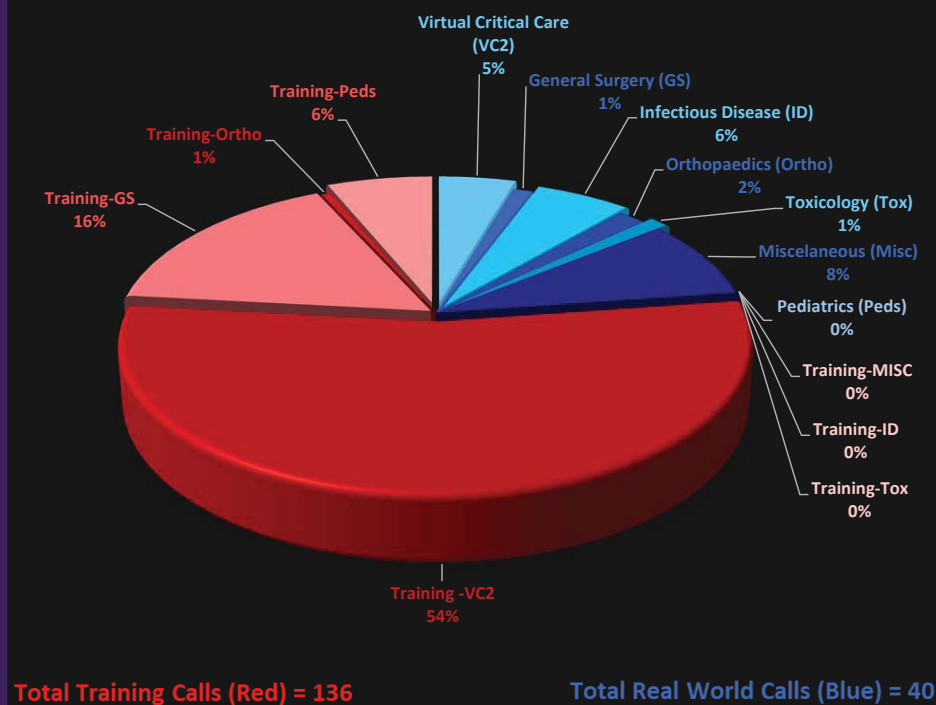
**ADVISOR** continued from page 8**18 MONTH DATA FOR NUMBER & TYPE OF CALLS**

Figure 3. Call volume for training (red) and real world (blue) calls.

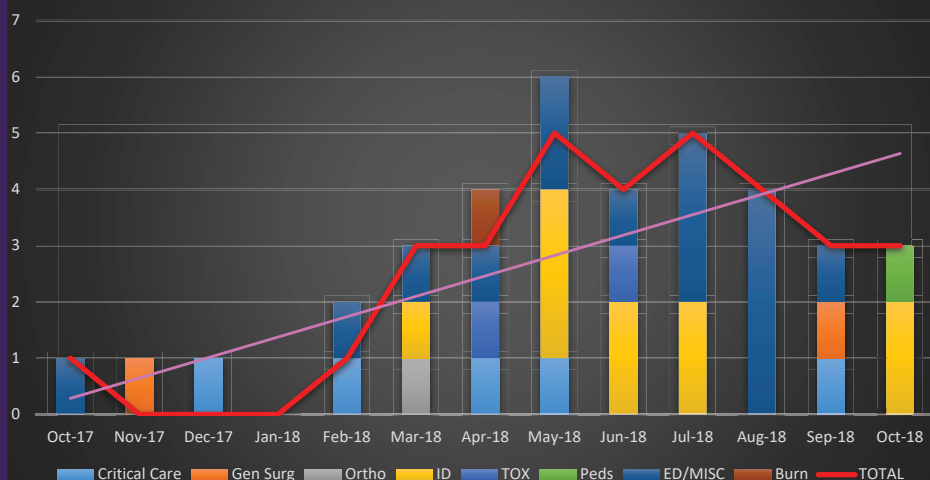
**Monthly Real World calls by Service**

Figure 4. 12 months call volume for real world calls. Linear trendline demonstrates notable increase in call volume over time.

knowledge/skills/abilities) and the ability to rapidly evacuate a casualty to them, telemedicine is an option for the alternate or contingency plan.

The ADVISSOR project and subsequent transition to the

ADVISOR system has demonstrated that delivery of remote telemedical consultation using phone calls, enhanced by emails with images and background data is a technically feasible and a medically viable option

for deployed forces to help care for a full spectrum of casualty. This project has helped define best practices for conducting critical care consultations between a medic and a sub-specialty board certified physician which are summarized in Table 2 (Vasios 2017, Nettesheim 2018).

Mr. Mike Kile, Operations Readiness Program Manager for the U.S. Army Virtual MEDCEN stated, "ADVISOR has quickly become the backbone for operational medicine support from the Role IV reaching all the way forward to the point of need. The simplicity of making a call for help, with the capability to scale to need, will allow the medical force to have an even greater impact on preserving combat power and increasing Soldier lethality."

For more information about operational virtual health, please visit: <https://prolongedfieldcare.org/telemed-resources-for-us-mil/>. For the ADVISSOR phone number and how-to-guide, please e-mail: [dod.ADVISSOR\\_Office@mail.mil](mailto:dod.ADVISSOR_Office@mail.mil) from a .mil address. ■■■

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## Employee Spotlight

### Retirement of Ms. Esmilda “Angie” Hill

On 31 January, Ms. Esmilda “Angie” Hill retired from TATRC after 31 years of dedicated civilian service. Angie served as the Executive Administrative Assistant for TATRC’s Mobile Health Innovation Center (mHIC) located at Fort Gordon in Augusta, GA. Prior to joining the TATRC team, she had worked at Fort Gordon for 24 years, starting with a new telemedicine organization called the Center for Total Access that eventually merged with TATRC in the early 2000s.

Angie was a tremendous ambassador for TATRC at the Fort Gordon campus with our counterparts and partners within Dwight David Eisenhower Army Medical Center and the U.S. Army Cyber Battle Lab.

She greeted everyone with her infectious smile and did



*Congratulations Ms. Esmilda “Angie” Hill!*

everything she could to assist and resolve any issues that arose during the work day. She was devoted and committed to her professional duties, which included all aspects of running the day-to-day office operations for

over twenty staff members, and will be sincerely missed by the entire TATRC family, especially her mHIC Team.

When asked about her time at TATRC and how she felt about the organization, she summarized it by saying, “TATRC fosters an environment of excellence that encourages and enables you to be at your best by affording various opportunities to work with the best!”

Now that her government career has come to an end, she will focus her energies in her ministry duties in the church that her husband Clarence Hill serves as the lead pastor. She will also be joining her daughter on numerous travel adventures!

Congratulations on your retirement, Angie, and best wishes for your future! ■■■

### mHIC Welcomes New IT System Administrator to the Ft. Gordon Office

Mr. Richard “Rick” Eshman recently joined the TATRC team as an IT System Administrator supporting the Mobile Health Innovation Center (mHIC) at our Fort Gordon office. Prior to joining mHIC, Rick had worked as an IT System Administrator and Information Security Engineer for

government contractors for over two and a half years.

He retired from the U.S. Navy after 20 years as a Submarine Information Technology Specialist and Fire Control Technician. During his time in the Navy, he had served in a variety of roles including Lead Chief Petty Officer, Maintenance Material Management Coordinator (3M Coordinator), Information Systems Security Manager Course Instructor, Training Director, and Site Lead at two different learning site detachments.

Rick received his Bachelor of Science (BS) degree in Information Systems Security in 2014 while on active duty, and completed a Master of Science (MS) in Information Technology Management in February 2019.

Rick is married with 2 children and 5 dogs, and outside the office, he



*Mr. Rick Eshman, IT System Administrator*

frequently takes karate classes with his daughter.

TATRC welcomes Rick to the mHIC office and is happy to have his on-site IT expertise! ■■■



## Congratulations to Ms. Stephanie Edwards, TATRC's Q2 Employee of the Quarter

**M**s. Stephanie Edwards has been named TATRC's Employee of the Quarter for the 2nd Quarter of FY19 for her continuing work and untiring efforts as a supporting Project Officer assisting the Health Technology Information Center (HTIC) and Medical, Modeling, Simulation and Visualization Lab (MMSV).

Ms. Edwards has served as the scrum master for the Team Fitness Tracker, the now completed Linked Problem List, and the JMEDSIM portal development. She is extremely diligent in the completion of all tasks assigned to her, and willingly seeks additional

assignments. Stephanie seeks knowledge so she can better learn and understand health informatics and medical modeling and simulation to become a valuable, contributing member of the team. In addition, she manages and oversees TATRC's other project officers to delegate responsibilities and assists with tasks among multiple labs.

Your contributions day-in and day-out reflect great credit upon you and the value you bring to the TATRC Team!

Congratulations Stephanie and thank you for all that you do in support of TATRC's critical mission! ■■■



*Ms. Stephanie Edwards, Project Officer is the Employee of the Quarter for Quarter 2.*

## This Quarter's TATRC TRIVIA...



*The Samuel J. Heyman Service to America Medal, aka the "SAMMIE" award, is considered the government's civil servant equivalent of the Oscars. In 2016, what distinguished TATRC Lab Director was given this illustrious award in the Science and Environment category for their work on a first-of-its-kind, portable computer system that enables medics to diagnose and treat patients quickly and accurately during emergency transport and alert trauma centers to prepare immediate blood transfusions?*



### Answer to Last Issue's TATRC TRIVIA...

*Question: This mobile app won the 2010 Army Greatest Inventions Award for its HIPAA-compliant design that allowed for secure communication between our Warfighters, doctors and third parties. What is the application called?*

*A: The mCare application won the 2010 Army's Greatest Inventions Award for its HIPAA-compliant design that allowed for secure communication between our Warfighters, doctors and third parties.*

# AAMTI

## PROJECT SPOTLIGHT

### Using Wearable Sleep Monitors to Improve Behavioral Health Care of Service Members' Families: A Clinical Quality Improvement Project

Sleep dysregulation is a common symptom of numerous behavioral health conditions. Research suggests that treating sleep dysregulation can help improve not only the sleep of the patient, but improve the primary behavioral health condition of which the sleep dysregulation is a symptom. Subjective patient reports ("sleep logs" or "diaries"), are most typically used in clinical practice to assess patients' sleep. However, having a way to more objectively assess sleep quantity and quality—both initially and after intervention—would improve a clinician's ability to evaluate and

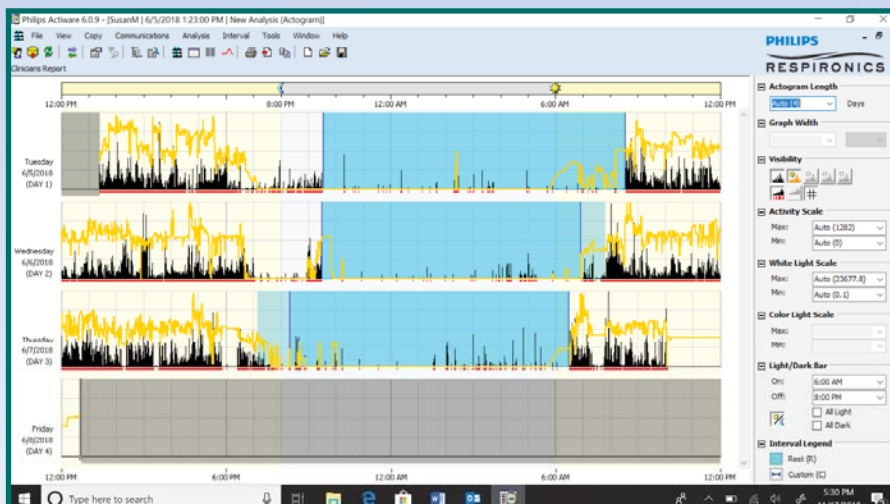
subsequently to treat a patient's sleep.

The goal of this project was to introduce clinicians to an inexpensive medical-grade device—the Actiwatch 2—that enabled them to more objectively monitor their patients' sleep patterns, with the expectation that they would be more comfortable with such a device, and more likely to use them in their patient care. Clinicians often express hesitation in using new approaches to measurement and monitoring with which they are unfamiliar. In this initial phase of the project, our intention was to demonstrate to clinicians in the Child and

Family Behavioral Health Service at Tripler Army Medical Center, that these devices were simple to use, and could provide clinical information about sleep that was both easy to interpret and clinically valuable. Given the hesitation that we suspected most clinicians would experience in using this unfamiliar sleep monitoring device on their patients, the devices would be worn by the clinicians themselves, and the data provided to them would be about their own sleep patterns.

In our project, the team first developed their own understanding with the devices in set-up, familiarization with the software, short trials of use, and in data analysis and interpretation. Next, clinical staff (non-patient) volunteers were obtained for Actiwatch 2 use through a general announcement in staff meetings. Our team provided a brief set-up and instructional session before each trial with a participant, and a brief data analysis and review session with the participant after each trial. Pre- and post-trial questionnaires were administered to the subjects and then compared to see if the subjects' comfort with Actiwatch and likelihood of use with patients increased with the trial of their use.

The goal of the project was to enlist 10 clinician-volunteers from the staff of approximately 22 credentialed clinicians (including both Psychiatry and Psychology Fellows). The 10 volunteers were quickly and easily attained; 9 of whom completed both pre- and post-monitoring



Sample "Actigraph" from single clinician/subject, showing 3, 24-hour periods including 3 nights of sleep data. Of interest, this subject has young children, leading to several periods of movement at night (black vertical lines within blue shaded periods). This illustrated to the subject, the sensitivity and validity of the Actiwatch data.

**Wearables Sleep Monitors** continued to page 14





# AAMTI

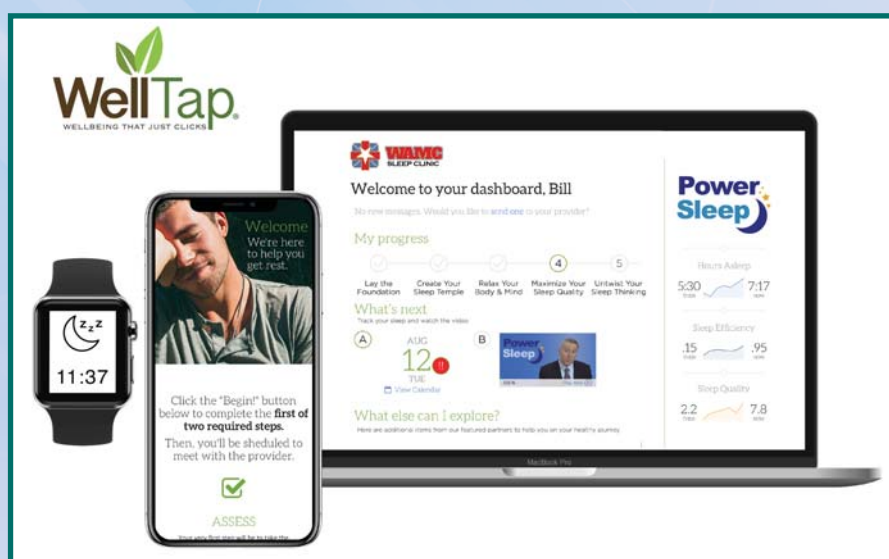
## PROJECT SPOTLIGHT

### Online Cognitive-Behavioral Treatment for Insomnia (OCBT-I) in the Primary Care Setting: An Efficacy and Feasibility Project

Insufficient and disturbed sleep are signature injuries of the Global War on Terror. The unrelenting operational tempo of military life, combined with non-traditional work schedules and high stress, all contribute to a culture of chronic sleep loss. Fewer than a third of Service Members obtain even the bare minimum (seven hours) of sleep recommended for adults. Further, clinical sleep disorders such as insomnia, obstructive sleep apnea, and nightmares are far more common among Service Members than among the civilian population.

Consequences of these sleep problems range from impaired mental performance on duty to worsened physical and mental health. For example, among Veterans of Operations Iraqi Freedom and Enduring Freedom, pre-deployment insomnia, defined as difficulty falling asleep or staying asleep, was very strongly linked to post-deployment post-traumatic stress disorder (PTSD). In fact, insomnia increased the risk for PTSD even after controlling for mental health history and combat trauma exposure.

Multiple Army-wide initiatives have sought to change the culture of sleep loss for the betterment of Service Members. Sleep research has been central to the Army Performance Triad, which seeks to improve physiological and psychological health and resilience through improved diet, exercise, and sleep. In terms of treating clinical sleep disorders, however, much work remains. The most important need is to increase access to care. "There is a gross shortage of trained sleep specialists in the military," says LTC Scott Williams, the project's lead, formerly at Womack who now serves as the Director for Medical Services at Fort Belvoir



Mobile sleep management platform delivers evidence-based sleep treatments that can be supported remotely, enabling a joint service solution. The system pictured has demonstrated utility in the Womack Army Medical Center Sleep Disorders Clinic. Future efforts seek to tailor and implement the system in non-specialty settings.

Community Hospital. "Demand for sleep medicine services greatly exceeds available supply."

One potential solution to increase access to care is to employ telehealth approaches, which can scale and help to overcome the shortage of specialist providers. Further, many telehealth options are preferred by patients because they require fewer in-person visits than traditional approaches, which can be more convenient for Service Members with many schedule demands.

Among the most promising telehealth approaches to sleep disorders are online treatments for insomnia.

These automated systems are designed to mirror in-person cognitive-behavioral treatments for insomnia (CBTI). More than 100 randomized controlled trials support in-person CBTI, and it is the recommended first-line treatment of the National Institutes of Health, American College of Physicians, American Academy of Sleep Medicine, and other leading bodies. Further, over a dozen randomized controlled trials (RCT)s have found online versions to reduce insomnia severity, although effects are slightly

*OCBT-I continued to page 14*

## *Wearables Sleep Monitors*

*continued from page 12*

questionnaires. Based on their responses to the pre- and post-trial questionnaires, all participants reported increasing their familiarity with various aspects of use of watches. All stated that they would feel comfortable using the devices to monitor their patients' sleep. After completion of the trial, however, several of the clinicians indicated that they did not feel fully comfortable in interpretation of the sleep data, if they were to use them with patients, but expressed interest in gaining additional familiarity with such interpretation.

Based on these findings, it was determined that use would be feasible in a clinical population. In the case of the volunteer clinicians who used the Actiwatches, knowledge of and comfort / familiarity with the Actiwatch 2 increased, as did likelihood of use in their own clinical practice. Some additional training – particularly in interpretation of the Actiwatch data – would be important before clinicians could independently, and comfortably, interpret the data with their patients.

The Actiwatch 2 software in particular provides clinically meaningful values such as sleep efficiency, wake after sleep onset, sleep onset latency, and number of awakenings. These values are paramount to carrying out sleep restriction therapy in insomniacs, assessing improvement of sleep symptoms in those with depression and anxiety, and evaluating and treating patients with primary sleep disorders.

In the present project, the study team, comprised of all

clinicians, took responsibility for preparing the Actiwatches for each clinician, and then made themselves available after 3-5 nights of sleep recording to download the data and review the sleep metrics with each clinician. These processes were included in the design of the project so that the team members would gain total familiarity with the devices and the information they provide. However, in practical, clinical applications, the team felt it would be more efficient to have a technician / nurse trained in setting up the devices to provide them to the patients at the clinician's request. That same individual should be skilled in downloading the data when the device is returned by the patient, and could further assist in reviewing the data with the clinician prior to discussion with the patient.

"This clinical quality improvement project demonstrated that providers in a clinical setting can easily gain sufficient knowledge, comfort and familiarity with wearable sleep monitors, and are subsequently more likely to use those devices in their own clinical practice for evaluation and treatment of sleep symptoms in their patients," stated Dr. Stanley Whitsett, PhD, the project lead for this project and Deputy Chief, Child & Family Behavioral Health Services, Tripler Army Medical Center. "Providers trained to use such wearable sleep monitors may then have access to a wealth of objective and accurate data on sleep quantity and quality of their patient population. Without a doubt, this AMEDD Advanced Medical Technology Initiative funded project, can transform evaluation and treatment of sleep symptoms in primary behavioral health conditions and in primary sleep conditions that likely exist in any patient population." ■■■

## *OCBT-I continued from page 13*

weaker and dropouts significantly higher, than when compared with face-to-face care.

Given the shortage of insomnia specialists, the purpose of this project was to test an online CBTI approach in a primary care setting. "On one hand, our project team was well aware of important differences between our military population and the civilian populations studied in the literature," states Dr. Williams. "On the other hand, we wanted to offer online treatment in high volume settings in a way that did not burden busy primary care providers. So we evaluated the sleep screening questions recommended by the U.S. Army Medical Command to identify patients who could benefit from a type of intervention with demonstrated efficacy among civilians."

The project was conducted at Womack Army Medical Center in Fort Bragg, NC and Fort Belvoir Community Hospital, in Virginia. LTC Williams stated, "LTC Joe Dombrowsky and Dr. Juliana Ee did a great job as on-site PIs, and we had additional co-investigators, as well as research coordinators to provide a majority of the screening."

While recruitment for this study has ended, the effort has been extremely fruitful and has provided a tremendous amount of material for follow-on work. "We've learned a great deal from this study, and we are grateful to the AAMTI Program for supporting this vitally important work," states Williams.

The study had three major takeaways.

First, many Service Members sleep poorly but deny daytime consequences. In our project, nearly half of 2,865 Service Members

screened reported sleeping less than seven hours each night yet also denied any daytime consequences. The most likely explanation is well-known in the scientific literature – that is, humans are very poor judges of their own sleep-related impairment.

Second, sleep complaints among Service Members are likely to be comorbid with other medical and psychiatric disorders. The data collected in this project suggest that Service Members with insomnia are likely to suffer significant medical and psychiatric co-morbidity. Of 402 Service Members who completed the detailed eligibility screening, the most prevalent comorbid conditions were moderate to severe pain, a high risk for obstructive sleep apnea, anxiety, PTSD and depression. This tells us that in addition to primary care, we should be aggressively screening for sleep complaints in behavioral health.

Finally, based on this project and other recent findings in the literature, we have revised our questionnaire to advance sleep health care for Service Members. Not long ago, another investigative team published findings from a highly controlled RCT of online CBTI. These authors found that both online and in-person CBTI improved sleep among Service Members. Although their highly controlled design differed from our own real-world study, their findings are consistent with our hypothesis and clinical experience that online CBTI can be effective among Service Members. Thus, the next step in our research program is to adopt an implementation science approach. We are currently advancing efforts to engage stakeholders (patients, providers, clinic staff, even hospital and administrative leadership) to identify barriers and facilitators to increase the use of online tools, to maximize reach and effectiveness. ■■■





## MMSV Lab Collects Key Data in Augmented Reality Forward Surgical Care Capstone Event



Non-surgical provider using augmented reality glasses to perform a 4 compartment fasciotomy.

In February, TATRC's Medical Modeling, Simulation and Visualization (MMSV) lab hit the road and traveled down to Fort Bragg to take part in a Capstone event for the Augmented Reality Forward Surgical Care project, funded through the AMEDD Advanced Medical Technology Initiative's Extended Innovation Funding. This project, which was done in collaborative partnership with the U.S. Army Special Operations Command's Womack Army Medical Center and vendor, BioMojo, aimed to integrate augmented reality headwear into prolonged field care. The augmented reality will provide surgeons the ability to telestrate to non-surgeons in an effort to perform lifesaving procedures.

This important research was due to the realization that the Army has a lack of surgeons available to perform in traumatic events likely to be seen in a war zone. With the help of a strong training curriculum for non-surgeons in these procedures, as well as a surgeon able to telestrate necessary information onto the body of the injured, large strides can be made to increase the readiness of our medical professionals. Mr. Geoffrey Miller, Lab Manager of MMSV, stated, "providing these types of advanced, augmented reality tools to improve care is vitally important to the success of the Army's mission."

Mr. Geoffrey Miller was accompanied by Ms. Ollie Gray, Project Manager, and Mr. Jimmy Gaudaen, Project Officer. They were heavily involved with running the assessments for the event, and are currently analyzing all the data collected. Some



Expert Surgeon telestrating a procedure to a provider wearing augmented reality glasses.

of this information included usability testing from end users on how well the glasses benefited the non-surgeon during the simulated scenarios. Once everything is analyzed, the MMSV team will make recommendations for improvements to the design of the augmented reality glasses to best support military medical professionals in the field. The project also aims to demonstrate that the telestration process and training curriculum used in this exercise provides non-surgeons the ability to provide care equal to that of what a surgeon would be able to do in similar real world scenarios. ■■■



## mHIC Receives Full Authority to Operate (ATO) for the MHCE-R / mCare system



On 2 January, TATRC's Mobile Health Innovation Center (mHIC), located at Fort Gordon, GA,

received a full Authority To Operate (ATO) under the new Defense Health Agency (DHA) Risk Management Framework (RMF) certification system for the Mobile Health Care Environment Research (MHCE-R). TATRC's MHCE-R is one of the first projects to successfully complete this transition within the DHA.

By meeting this milestone, TATRC's mHIC is able to adhere to a set of standards and management activities to increase awareness of and improvements made to the security posture of MHCE-R. The new RMF process establishes a more realistic range of risk tolerance for a system instead of an overarching yes or no answer of whether the information is secured or not. This updated RMF standard ensures MHCE-R will be more agile

and responsive to current and emerging cyber threats. According to Ed Brindley, DoD's Acting Deputy Chief Information Officer for Cybersecurity, "[RMF] offers an opportunity to get federal civilian agencies, DoD, and the intelligence community all using the same process."

Ms. Jeanette Little, Lab Manager for mHIC stated, "mHIC's MHCE-R infrastructure has had previous ATOs under the old, DIACAP system for many years, but this is the first occasion that we have received full certification under the new RMF system. Because of the significant differences between the DIACAP and RMF systems, this represents an enormous amount of effort and will lead to more opportunities to leverage this technology for future use cases."

mHIC's IA Officer, Larry Williams, echoes the importance of this new certification, "being one of the first projects in the entire DHA to achieve an RMF rating is a huge achievement for us. We can immediately apply the lessons learned going through this process to help ensure an efficient transition for all future TATRC work." ■■■

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## On the Horizon...

### Upcoming Events:

- 8 - 25 July:** TATRC's MISL Lab Research Eval & Exercise, Fort Dix, NJ
- 14 - 19 July:** Mountain Path 7, Greenville, NC
- 30 July - 1 August:** DHITS 2019 Conference, Orlando, FL
- 19 - 22 August:** 2019 MHSRS Conference, Kissimmee, FL
- 2 September:** Labor Day
- 23 - 25 September:** MedTech Annual Conference, Boston, MA