

From the Desk of TATRC's Science Director: Surviving and Thriving in a Fiscally Constrained Environment: To do so--One must *Adjust*

Since the beginning of time, in order for a laboratory to survive, laboratory personnel had to submit proposals in order to receive approval and funding. This is not unlike the academic environment where the phrase, 'Publish or Perish,' is renowned. So what does a laboratory do to survive and thrive when funding sources dwindle or go away?—You adjust!!

Not so many years ago, TATRC managed about \$500 million in Congressional Special Interests (CSI) funds, of which TATRC received about 10% for TATRC research and operations. Out of this 10% of money, TATRC was able to obtain over sixty IPAs (intergovernmental personnel act). Most of these individuals were renowned subject matter experts in their respective fields, some of which worked full or part time while affiliated with academic institutions. Access to their wealth of knowledge enabled TATRC to be involved in many different research areas, as well as, have a host of strategic thinkers. These IPAs complimented the TATRC staff and together they accomplished great research.

When the CSI management mission went away, TATRC had to adjust. TATRC personnel went from managing other people's research to submitting research proposals in which they served as the Principal and co-Principal Investigators. Within eighteen months, four of the TATRC laboratories were funded for over 30 different research projects. TATRC's Biotechnology High Performance Computing Software



Dr. Francis McVeigh, Science Director, TATRC

Applications Institute (BHSI) has long received monies from Department of Defense, e.g., Defense Threat Reduction Agency, the Assistant Secretary of the Army, Acquisition, Logistics and Technology (ASAALT) and Defense Health Program resources (multiple Joint Program Offices). The BHSI has an average of forty ongoing research projects at any one time and were not as dependent on the CSI funding. The rest of the TATRC Laboratories were more dependent and did what they had to do--they adjusted.

Today, TATRC is facing a new set of challenges, i.e., reduced research funding opportunities, more laboratories applying for the same research funds, and a new MEDCOM Regulation that does not allow for the hiring of IPAs—what some would refer to as a triple whammy. In light of these new challenges, TATRC

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TATRC Team hosted the MHS Virtual Health Workgroup earlier this May with a series of briefings and demonstrations.

chose not to fold our guidon but rather to further advance it down the field by adjusting.

So how did TATRC respond? TATRC adjusted. TATRC lab personnel increased internal collaboration across their labs and together, developed highly competitive, far-forward thinking pre-proposals. Additionally, they honed in on identified gaps, and requirements; sought out internal and external research partners and developed Memorandums of Agreements and Memorandums of Understanding with them. Lastly, they sought out Program Offices and developed Technical Transition Agreements so that they could share their acquired research knowledge with hopes of getting solutions into the hands of Soldiers.

In addition to internal TATRC adjustments, I decided it was time to expand our scope outside of the MHS. In this pursuit, I attended three different events in search of finding solutions to meet our resource challenges (seeking ways to adjust). Accompanied by the TATRC Laboratory Leads, minus BHSAL, we visited Arizona State University (ASU). The reason for this visit is that several months prior, I observed during a DoD SBIR

Conference that ASU had several posters in areas that synched with TATRC's focus areas. My thought was to further our discussion with their academic professors in the hopes of building future collaborative efforts. My thoughts were that this could help mitigate our loss of IPAs by finding interested academic personnel who would want to collaborate. Only time will tell if this will bear fruit.

Next I presented a briefing at the Medical Technology Enterprise Consortium, (MTEC) Meeting. During the briefing, I discussed the new Army-funded research areas that TATRC was asked to serve in the role of a Capability Area Manager (CAM), i.e., medical Robotic and Autonomous Systems and Virtual Health. MTEC was established as an enterprise partnership to facilitate research in transition of life science technologies. As stated in the MTEC literature, 'In order to build these complex capabilities, it will require a focused and well managed public-private hybrid effort (e.g., DoD, other Federal Agencies and multiple private industry companies) to provide solutions.' The beauty of this partnership is that both sides—DoD and industry companies pool their monies—and in some cases doubling the amount of money that you can put

toward a research effort. Following my presentation, I sat down with twenty plus different companies who had an interest in working with TATRC. Recently, I invited the MRMC headquarters' individuals who are working with MTEC to brief our laboratory staffs. Our staff now has a better understanding of the potential benefits of working with MTEC partners, such as, shorter contract timelines, easier to converse with potential collaborators; and increasing the monies available for research efforts.

Following the MTEC Symposium, I participated in the Federal Laboratory Consortium Meeting. This meeting offered both training and networking opportunities designed to facilitate attendee's commercialization endeavors. This year's meeting centered on our Nation's continued focus to move federal research and development from out of the lab and into the marketplace by strengthening relationships with the private sector. Although TATRC is more focused on the earlier stages of research, this venue provided many 'take aways' such as when the head of the Army Research Laboratory and others, stated, 'An important way to further your research is to partner with academia,'—which was our intent with the ASU visit. I also had an opportunity to meet with multiple folks (vendors and other federal lab personnel) who were interested in the TATRC research focus areas. Again, only time will tell of the secondary and tertiary benefits of these encounters.

After participating in these external venues, I decided that it might prove beneficial to look within the Medical Healthcare System, (MHS) to find and develop future opportunities. As an active participant in the Army's and MHS' Virtual Health (VH) Workgroups, I thought it was time for the MHS VH Workgroup to learn more about TATRC's current and future research efforts, so I sent the workgroup a list of all of our current research and SBIR efforts. For your information, the MHS VH Workgroup consists of Army, Navy,



Air Force and Defense Health Agency (DHA) Virtual Health Leads and their staffs. After the workgroup reviewed the TATRC active research and Small Business Innovation Research project lists, they selected twelve projects relevant to their missions that they wanted to hear more about. To accomplish this, we scheduled an MHS VH Workgroup Visit to our TATRC Innovation Campus in mid-May. During the visit, the TATRC staff presented briefings and interactive demonstrations. We started off with a briefing about TATRC's mission, vision and organizational laydown, followed by a briefing on the Multi Domain Battlefield Concept, which highlighted the needs and challenges in this environment to perform virtual health, and ended with presenting briefings and demonstrations on the workgroup's pre-selected research topics. Following this, we discussed how to build virtual health requirements with MAJ Yuri Campbell from the Capabilities Development Integration Directorate, AMEDD Center and School, and LTC Francisco Dominici, OTSG Virtual Health Office, who is responsible for the Virtual Health Defense Business Certification (DBC) oversight. These important discussions helped clarify the processes and documents needed; and most importantly, laid out the Joint Services and DHA way ahead, which was extremely timely as the Army OTSG's Virtual Health Office has been tasked to lead the development of the Joint Virtual Health Requirements.

During their visit, I repeatedly emphasized to the workgroup that TATRC is focused on finding solutions to identified gaps and requirements and does not engage in research until we have an agreement with a program office for transitioning our products (mostly knowledge) to avoid our efforts from falling into the research valley of death. We offered to work with workgroup personnel to continue to share the knowledge that we have learned, and to perform research in areas which they need and/or want more information.

Prior to the MHS VH Workgroup visit, the Mobile Health Innovative Center's (mHIC) Lab Lead presented a briefing to the workgroup on the Mobile Health Care Environment (MHCE), which has had multiple published articles; repeated DBC approvals in both the research and operational lanes; resides on a DISA server; and has already paid for a majority of the operational costs. Some of the MHCE research projects highlighted, were the work with the Wounded Warrior Units, i.e., bi-directional communications between the Soldiers and their case managers; keeping behavioral health providers and their patients connected when one or both of them move away from their current area; and home monitoring of diabetic patients. This information was presented and demonstrated again during the MHS VH Workgroup visit. mHIC's Deputy Lab Manager closed by briefing MHCE's top 10 Lessons learned from 10 years of mobile clinical research, and shared his thoughts on where the future of mobile health clinical research is headed for the MHS. This was an excellent example of sharing our research and gained knowledge on what worked and what didn't work, which brings much value when others begin to seek similar solutions for the enterprise—this type of information will save time and money.

So what other ways is TATRC adjusting? TATRC laboratory personnel continue to seek and find different funding opportunity sources, such as, multiple Joint Program Offices (Defense Health Program funding), DHA, and ASAALT. Once we discover willing collaborators, some of which have been our partners before, we together chart a research way ahead. Some of our recent partners have included the DHA, SOCOM, Marine Warfighter Lab, and other federal organizations and laboratories.

Recently, TATRC has been supported by organizations outside of the Medical Research and Materiel Command, to perform research on pressing issues. For example, ASAALT recently recognized

TATRC's knowledge and ability to serve as CAMs in the areas of medical robotic and autonomous systems and virtual health. Furthermore, ASAALT provided funding to TATRC to manage in these areas. The DHA asked and funded TATRC to perform research to improve simulation – based education and assessment across the MHS; and most recently, TATRC has been asked to consider filling in some of the interim gaps as the MHS transitions to a new electronic health record. There is no doubt in my mind that the individuals requesting this support know of and respect TATRC's ability to deliver quality, timely results in a multitude of areas.

These new missions are complicated and expansive and we do not accept them until we are confident that we can deliver on what is being asked. As TATRC continues to adjust by analyzing and accepting these missions, we do so because we realize their importance to the enterprise. As an example of some of the work that is involved with these new missions, the CAM's responsibility includes establishing steering committees, selecting research topics, requesting intramural and extramural proposals, having these proposals vetted, and management of these areas. It is interesting to note that unlike DHP two year funding, these ASAALT funds are five year funds in the Program Objective Memorandum. Our other new missions require extensive coordination and cooperation across the MHS that involves our TATRC staff and many others.

As TATRC continues to adjust, we soon will be welcoming a new Director and Deputy Director, who will guide, support, and help us build upon what we are doing and more importantly- chart new research efforts and opportunities.

It has been said, 'I can't change the direction of the wind, but I can adjust my sails to always reach my destination.'— and that is what TATRC is doing!! ■■■

BHSAI Develops a Website for Predicting Pharmacological & Toxicological Properties of Molecules Not Studied Before

Military medicine is facing ever increasing and greater challenges in maintaining Force Health Protection by diagnosing and treating Warfighters exposed to diseases and hazardous chemicals. The threat of a chemical or toxicant being released among civilians during a terrorist attack creates a strong incentive to develop effective countermeasures and tools to quickly assess the pharmacological and toxicological properties of compounds not studied before.

The U.S. Army Medical Research and Materiel Command is involved in developing drugs and countermeasures in multiple areas, including military-relevant infectious diseases and chemical biological defense. Drug discovery is a risky and resource-intensive endeavor with high attrition rates. For a drug to be effective, a potent molecule must reach its target in sufficiently high concentration and remain in its bioactive form long enough to have an impact. For almost three decades, a major focus in drug discovery has been to reduce the attrition rate. The development of assays and mathematical models to assess the adsorption, distribution, metabolism, excretion, and toxicity (ADMET) properties of a compound has greatly reduced the attrition rate. Yet toxicity remains a hurdle, and is responsible for 40% of failures among new drugs.

In an effort to reduce the attrition rate and identify ADMET issues at an early stage, TATRC's Biotechnology High Performance Computing Software Application Institute (BHSAI) is working together with the Defense Threat Reduction Agency to develop mathematical models that predict ADMET properties. A team of scientists at the BHSAI, led by Dr. Anders Wallqvist, has developed the variable

Nearest Neighbor (vNN) method, which can rapidly assess the molecular properties of a compound with high accuracy. The vNN method relies on the basic idea that structurally similar molecules have similar physical properties and biological activity. "The fundamental idea has been known for more than a century, when Overton and Meyer discovered a correlation between the lipid solubility for a series of compounds and their anesthetic potency," said Dr. Patric Schyman, a scientist at the BHSAI. "But the ramifications of the vNN method go beyond just predicting molecular properties; it does so with confidence by only making predictions for molecules

that are similar to the reference molecules included in the model – this is the model's applicability domain."

Dr. Schyman developed and implemented the 15 ADMET *in silico* models, which are available on the vNN-ADMET website, and Mr. Valmik Desai designed the web-based user interface, which is capable of analyzing thousands of molecules. Dr. Schyman commented that "the vNN-ADMET web-tool will assist drug developers in rapidly evaluating pharmacological and toxicological properties *in silico*, before prioritizing and synthesizing compounds that have the highest chance of succeeding in the late stages of development." A description of the website and the method was recently published in *Frontiers in Pharmacology*.

Schyman P, Liu R, Desai V, Wallqvist A. vNN web server for ADMET predictions. *Frontiers in Pharmacology*. 2017; 8: 889. ■■■

vNN-ADMET

Build/Run Models +

Biotechnology HPC Software Applications Institute

ADMET PREDICTIONS

Job Name: ADMET Test

☐ Include model results based on a restricted applicability domain only
 ☒ Include model results based on an unrestricted applicability domain

1

2

Query	Liver Toxicity		Metabolism							Membrane Transporters			Others			MRTD (mg/day)
	DILI	Cyto-toxicity	HLM	Cyp Inhibitors for					BBB	P-gp Inhibitor	P-gp Substrate	hERG Blocker	MMP	AMES		
				1A2	3A4	2D6	2C9	2C19								
	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	180
	Yes	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	Yes	158
	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	527
	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No	No	Yes	No	3634
	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes	Yes	No	No	No	0.98
	No	No	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	No	Yes	No	No	313
	Yes	No	Yes	No	Yes	No	No	No	Yes	No	Yes	No	No	No	No	482
	No	No	Yes	No	No	Yes	No	Yes	Yes	Yes	No	Yes	No	No	No	9.7
	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No	6287
	No	Yes	Yes	Yes	No	No	Yes	No	No	Yes	No	No	No	No	No	2056

1

2

⊖ - Outside applicability domain - no high-confidence prediction available

The ADMET predictions result page. The 15 ADMET predictions for each query molecule are presented on a separate row. High confidence predictions are shown in solid colors and low confidence predictions are shown in striped. The website can be publicly accessed at <https://vnnadmet.bhsai.org>

TATRC Director Sets Sail on a New Adventure



COL Dan Kral, Former Director, TATRC

On Wednesday, 11 April, members from the TATRC staff gathered together for a spirited team send-off recognizing and honoring TATRC's Director of five plus years, COL Dan Kral. The group met for a surprise luncheon at his favorite local Pho restaurant to celebrate and acknowledge the countless contributions he has made to TATRC and military medicine in general, and engaged in a friendly "roast."

It was a bittersweet day for Team TATRC as we wished a fond farewell to our fearless leader, COL Kral. The COL was selected to serve as the Acting Chief of Staff at USAMRMC Headquarters and April 13th was his last day at the helm of the TATRC ship. Mr. Timothy McCarthy, TATRC's Deputy Director, will lead the organization and will serve as the Acting Director.

As President Eisenhower once said, "The supreme quality for leadership is unquestionably integrity. Without it, no real success is possible." COL Kral, thank you for your integrity and leading us to success these past five years. Your TATRC family will miss your hard charging spirit and dedication to innovation in the name of the Warfighter. Hooah! ■■■

On the Horizon...

Upcoming Events:

4 July: Independence Day

24 - 26 July: DHITS Annual Conference, Orlando, FL

1 August: TATRC Welcomes COL Gina Adam as our New Director

20 - 23 August: MHSRS Annual Conference, Kissimmee, FL

24 August: TATRC Welcomes New Deputy Director, LTC Jeremy Pamplin

3 September: Labor Day

12 September: TATRC's Annual Open House & Technology Demonstration

This Quarter's TATRC TRIVIA...



Question: Who was TATRC's First female Deputy Director?
(Answer will be in the next edition of the TATRC Times.)

Answer to Last Issue's TATRC TRIVIA...



Question: Who was TATRC's Director with the longest tenure from the years of 1997-2006?

A: Col Jeffrey I. Roller, (USAF)



TATRC Loses a Wise Guy

On 31 July 2018, TATRC will be losing a longstanding, vital member of the government team at our Fort Gordon office. Richard “Rick” W. Wise will be retiring with 13 years of civil service, from June 2005 to July 2018. He has served with distinction at TATRC’s Mobile Health Innovation Center (mHIC) as an Information Technology (IT) Specialist.

During his tenure with the organization, he has designed, established and maintained an IT Enclave to conduct research for numerous mobile and virtual health pilot projects using the highest standards of cyber security and information assurance requirements.

Rick’s technical experience, insight, vision, and design has been instrumental in maximizing the use of technology in order to conserve funds while providing a robust infrastructure with the speed, responsiveness and security required to conduct research focused on technology advancements to improve healthcare outcomes. He not only conceptualized the design and implementation of this IT research environment enclave, but has also physically mounted the hardware, installed the software, configured the edge devices and maintained this environment with limited personnel support. Rick has reliably maintained this infrastructure regardless of physical and technical challenges, including but not limited to power outages from weather incidents. Throughout his career, he has proactively addressed all issues in a manner that



COL Dan Kral (left) recognizes Mr. Rick Wise (right) for his years of distinguished service.

consistently maintained the highest standards of IT system availability.

Mr. Wise’s diligence and dedication to duty contributed to the successful execution of a number of TATRC research efforts.

Rick is an accomplished chef and world traveler, and is expected to spend his free time with his wife, Pat, his children and grandchildren in his retirement. He will be sincerely missed across the organization, as he has been a major contributor and vital part of the TATRC family.

Thank you Rick for your years of service! ■■■

TATRC Helps New Partner Go Mobile

TATRC’s Mobile Health Innovation Center (mHIC) is currently in active discussions with the Army National Guard (ARNG) to utilize TATRC’s mCare platform to meet several of their own emerging mobile medical needs. ARNG and TATRC have signed a memorandum of agreement (MOA) that is in the final stages of legal review to begin the historic partnership. Once approved, the MOA will allow for the transfer of resources between the two organizations to make the mutual software development collaboration a reality.

The ARNG is a federal military reserve force of the United States. The ARNG is divided into subordinate units stationed in each of the 50 states, three territories, and the District of Columbia, and operates under their respective governors. The ARNG has an authorized end strength of 343,500 soldiers. The ARNG’s Chief Surgeon’s Office is looking to expand its ability to interact with its service members directly through their own personal smartphones.

Moving to a mobile platform is expected to enhance unit communication, increase service member readiness and increase access to medical support resources.

“We were looking for an efficient way to augment our current online medical services, as well as find a way to provide mobile access to our *Guard Your Health* Program,” said COL Jeremiah Stubbs, Chief of ARNG Preventive Medicine. “After a thorough review of both commercial and federal solutions, we felt TATRC’s mCare platform was the right way ahead. We are excited to be partnering with TATRC to bring these powerful capabilities to our Soldiers,” Stubbs said.

mCare is an approved Military Health Systems solution providing bi-directional, HIPAA compliant, secure communications to and from service members’ own personal electronic devices. It was developed in direct response to a healthcare delivery gap and to meet required case management contact rates for remote Service Members in transition. It received the highly coveted U.S. Army Greatest Inventions Award in 2010 and became a MEDCOM Program of Record in 2012. mCare exceeded more than 2 million Service Member encounters in 2017 alone.

Work between TATRC and ARNG is expected to begin later this summer. ■■■



Newly Formed Army Futures Command Visits TATRC



Mr. Geoff Miller demonstrates some of the latest technologies & initiatives in medical modeling, simulation and training to LTG Edward Cardon.

On 17 April, TATRC was pleased and honored to host Lieutenant General Edward C. Cardon for a visit and tour of our initiatives and capabilities. As LTG Cardon is an advocate of “disruptive innovation,” visiting TATRC to learn about how we rapidly prototype and think outside the box was a natural fit. LTG Cardon is a senior officer in the United States Army who is currently the Director of the United States Army Office of Business Transformation, Office of the Undersecretary of the Army, and former commander of the United States Second Army/United States Army Cyber Command. LTG Cardon is tasked with designing the new Army Futures Command. According to TATRC’s Acting Director, Mr. Timothy McCarthy, “LTG Cardon’s purpose for visiting was to understand our TATRC processes and linkages, as well as to gain insight about what we are doing and how we do it.”

The day kicked off at USAMRMC Headquarters where LTG Cardon received an organizational overview, followed by a brief visit to Air Force Medical Evaluation Support Activity for a product review. After a working lunch, LTG Cardon then toured the TATRC field tents specifically in the areas of Virtual Health, Medical Robotic and Autonomous Systems, and Medical Modeling and Simulation where interactive demonstrations were on display.

The *Army Futures Command Task Force* reports that the “establishment of the Army Futures Command is the most significant Army reorganization effort since 1973. Army Futures

Command will be the fourth Army Command and will be tasked with driving the Army into the future to achieve clear overmatch in future conflicts.” Army Secretary Mark Esper stated, “You’ve got to remain open to change, you’ve got to remain flexible, you’ve got to remain accessible. That is the purpose of this command.”

The service announced it was standing up the command in October 2017 at the Association of the U.S. Army’s annual conference in Washington. The plan is to realign the Army’s modernization priorities under a new organization that will implement cross-functional teams that correspond with its top six modernization priorities: Long-Range Precision Fires, Next-Generation Combat Vehicle, Future Vertical Lift, the network, air-and-missile defense and soldier lethality.

As TATRC’s mission is to help utilize technology to fill future medical capabilities gaps, LTG Cardon’s visit was timely. TATRC’s Acting Director, Mr. McCarthy was pleased to be one of the first visits for the newly announced *Army Futures Command Task Force* leader. “LTG Cardon is looking far forward - for a systems model for development and implementation of innovative, disruptive technologies and ideas to shape the battlefield of the future. With such a strong alignment to TATRC’s operational medicine mission, we felt there was great synergy and cross fertilization to be offered to the Army Futures Command. We feel that his site visit to TATRC clearly demonstrated this. I’m very proud of our team today.” ■■■

AAMTI Project Spotlight: Web-Based Medic Tool

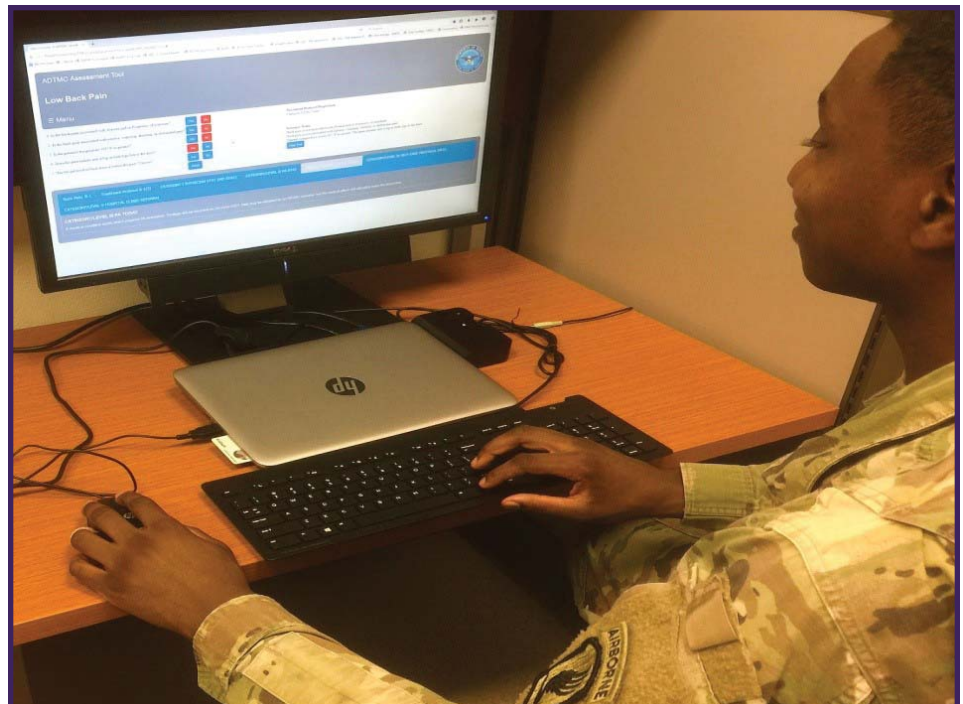
Currently, U.S. Army medics in the field carry the 269 page, 2-4 lb paper Algorithm Directed Troop Medical Care Manual (ADTMC) with them to Battalion Aid Stations (BAS). Moreover, as the medics already carry numerous heavy packs in the field, the heavy paper manual adds to this burden.

As the medics examine sick and injured soldiers, it is strict policy (SOP 173rd IBCT (A) Sick Call Protocols) that they must refer to the algorithms in the ADTMC paper manual and often have to flip through pages of 95 algorithms to get to the page with the clinically correct disposition on it.

Medics then must write the encounter information on paper to be taken back to the Garrison clinic which is uploaded as a document into AHLTA/HAIMS via a scanner. This process is time-consuming and inefficient as the medic must write a note on paper while examining the patient, viewing the manual, and transporting the many paper notes back to the Garrison clinic to be scanned into AHLTA/HAIMS. All documentation is still done on paper entirely. At times, the paper documents are lost and could expose the patients personal health information to non-medical personnel.

In 1992, the Army utilized the ADTMC manual as a means to standardize the care provided by medics at the Battalion level in the BAS. This also acted as a means of triaging and categorizing patients according to their injuries/illnesses and helped to prioritize treatment by a provider. DA PAM 40-7-21 was revised in 2006, but was still a cumbersome amount of material to carry as a medic.

Most BAS' have basic internet connectivity, but at times the internet connectivity can be lost, especially down range, so we are building a tool that will reside on a computer or mobile device as a dynamic HTML file. Internet connectivity is unnecessary for the tool



Medic utilizing the ADTMC manual at a Battalion Aid Station.

to work as it runs on the device the medic uses. This capability will enable the medics to continue their screening assessments and patient disposition duties.

There currently is no web-based tool available for the medics and providers with decision support and documentation generating capability that this tool will offer at the BAS.

With this AMEDD Advanced Technology Initiative (AAMTI) funded project, the aim is to build a digital tool to replace the bulky, cumbersome paper manual.

This tool is the first of its kind and is built specifically for medics and includes decision support based entirely from the content in the ADTMC paper manual being utilized in the Army at present. The paper manual is the only resource for medics to utilize for their ill and injured soldier care at BAS.

No PHI is contained in or passes through the ADTMC tool ever, as it will be built so that the medics will interact

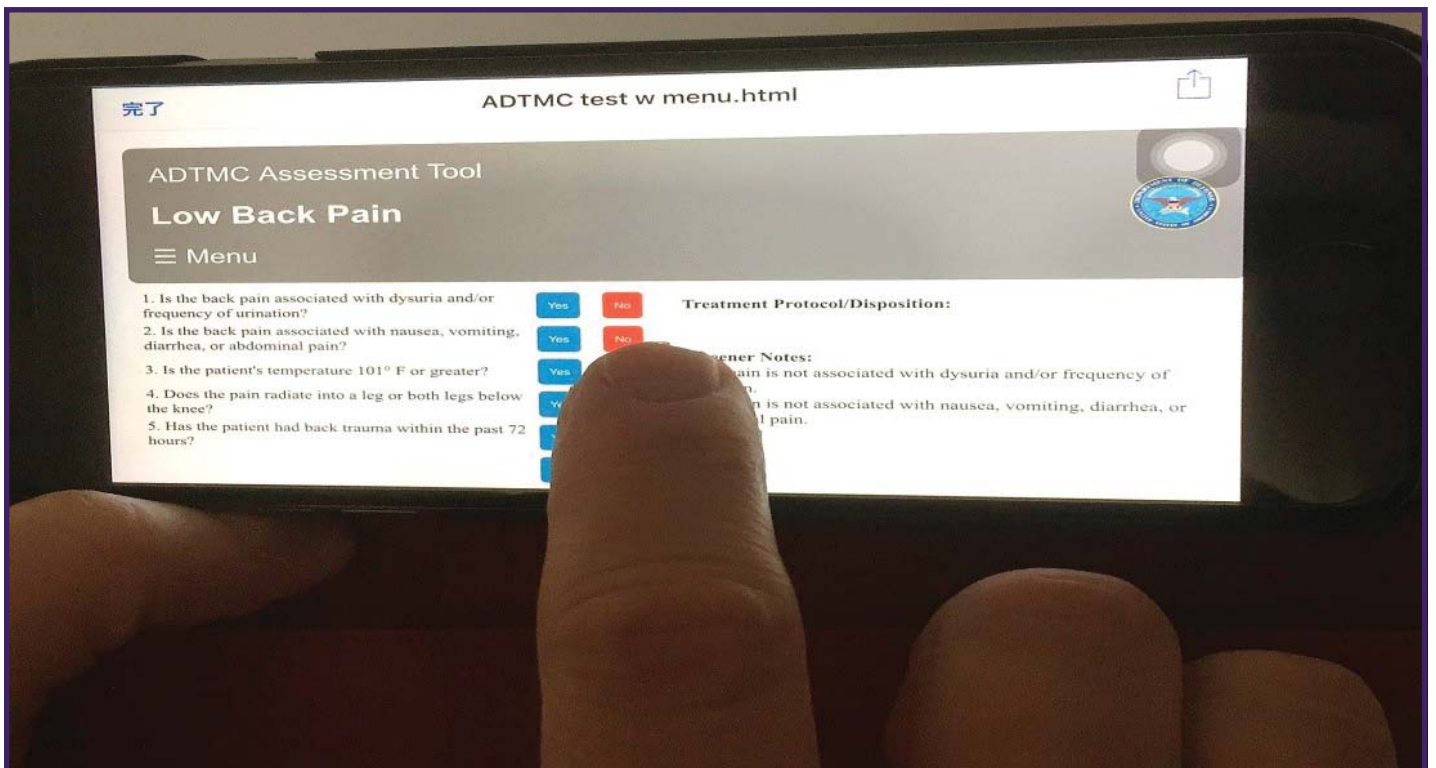
with the algorithms to reach a proper disposition of the patient. Only the web file is loaded onto the device that the medic would use normally and no additional software is needed or loaded onto government computers.

Mr. Christian Olsen, the software designer and developer describes the tool as, "this desktop and mobile friendly tool is a progressive web app that utilizes branching logic in its code to bring the 95 algorithms contained in the ADTMC paper manual to the medic's fingertips."

This tool will eventually be used by U.S. Army medics and providers at BAS around the globe. Medics at BAS are often the first responders to ill and injured soldiers and must screen these patients with the aid of the ADTMC paper manual. With our HTML tool, the medics will simply click through the digital algorithms and it will tell the medics the disposition quickly and efficiently.

Our beta test site is near Vicenza,





Display of the ADTMC being utilized on an iPhone device.

at the 173rd Airborne Battalion located in Del Din, Italy. The project involves the Garrison clinic and the three aid stations on Del Din. In addition to accessing via computer, it can be accessed via tablet, and/or smart phone in any Theater of operations.

MAJ Andrew Galdi, BCT Senior PA at the 173rd, sees the ADTMC as a truly useful tool for pre-clinic triage that their medics can use to determine level and timeliness of additional medical support needed. The ability to have an easily accessible tool that provides algorithm-based guidelines for screening patients allows providers the confidence that appropriate triage is taking place and establishes a basis for future medic training. MAJ Galdi added, "It is important that the medics have this foundation to support them particularly in more austere situations when additional medical support may mean risk of harm to others. Automating this capability makes it capable of being used and transported in numerous environments. It is a building block to develop medics into free thinkers by adding basic assessment and physical exam to provide fully clinically capable assets to the tactical fight."

CPT Adam O. Rich, RN, Brigade Nurse with the 173rd, believes that with widespread implementation of the ADTMC tool, the Army will be able to standardize the manner in which the majority of injuries addressed in the Troop Medical Centers (TMC) are being treated. "We at the 173rd IBCT (A) are excited about the opportunity to help with the development of this invaluable resource." As the Brigade Nurse, he is constantly

seeking ways in which he can help the Medics be self-sufficient in providing sound clinical treatment to our injured Paratroopers. "This digital ADTMC platform helps to provide the baseline knowledge that is expected of our Medics. It also ensures the same treatment is being provided for all similar injuries throughout our Brigade," he added. CPT Rich thinks that the push to create a new digital platform for ADTMC will help make this tool readily available to every Medic in the Army.

U.S. Army Africa, also known as the Southern European Task Force, has also expressed a great deal of interest in the tool for their medics in the field in various areas of Africa. MAJ P. Jason Auchincloss, APA-C, MPAS, U.S. Army Africa Senior PA / HHBn Surgeon described the value it will bring his medics, "ADTMC digital updates are long overdue. I see this being something that the Medics will utilize more often in the course of their duties and look forward to it going live. I hope the developers find ways to link it to AHLTA or AHLTA-T in the near future."

This tool will be interoperable with AHLTA/HAIMS, Medical Communications for Combat Casualty Care and the new Electronic Health Record, MHS Genesis. This tool will eventually be available to medics in the field "downrange" and Navy corpsmen aboard ship. ■■■

Employee Spotlight

Congratulations to TATRC's Q3 Employee of the Quarter, Tabitha Waldrop

Ms. Tabitha Waldrop, a hard charging team member of our Virtual Health Support Office (VHSO) has been selected as TATRC's Q3 Employee of the Quarter due to her extraordinary contributions.

Tabitha has worked tirelessly in reinvigorating and expanding the scope of the CENTCOM Telehealth mission. Through her diligent efforts, TATRC has re-established relationships with the CENTCOM Surgeon's Office, Office of the Surgeon General (OTSG), Defense Health Agency (DHA), Medical Communications for Combat Casualty Care (MC4) and most importantly, the Soldiers serving and delivering telehealth care throughout CENTCOM.

As the backup for the ADVISOR administrator, and the program manager for the Army email asynchronous teleconsultation and Army tele-dermatology programs, her daily actions and involvement were outstanding. When the individuals responsible for these efforts went down unexpectedly, Tabitha eagerly stepped in and allowed for continuous, uninterrupted teleconsultations, thus ensuring that Soldiers on point needing teleconsultation were taken care of in an expeditious manner.

Tabitha's oversight and coordination on the development of the white paper for Global Video Systems resulted in a concise, informative



Ms. Tabitha Waldrop, Training Development Supervisor is EOQ for Quarter 3

document that DHA and OTSG needed in order to make informed decisions. Her involvement in the establishment of a dashboard that reflects up-to-date metrics of asynchronous operational telehealth, gives our leaders the visibility of what is happening operationally for the first time. These efforts resulted in her being selected to serve on the MHS Telehealth metric sub workgroup.

Tabitha is frequently recognized by her peers at Fort Gordon and TATRC HQ, as a pleasant person to work with who is totally dedicated to the mission and always willing to assist others without being called upon.

Congratulations Tabitha! ■■■



Team TATRC Participates at Annual SOMSA Conference

Eight members from Team TATRC participated in this year's Special Operations Medical Association's Scientific Assembly (SOMSA) in Charlotte, North Carolina from 14 – 17 May. In addition to attending a multitude of outstanding and militarily relevant plenary and break-out sessions, TATRC personnel provided direct support for Special Operations Forces (SOF) Medic training sessions and oversight of the SOMSA Research venues for both oral presentations, as well as scientific posters.

Members from TATRC's Medical Intelligent Systems Lab (MISL) combined forces with the Medical Modeling, Simulation and Visualization (MMSV) team and partnered with LTC Jeremy Pamplin, an Internal Medicine Physician at Madigan Army Medical Center (MAMC), and MAJ William Vasios, a Physician Assistant at Special Operations Command Africa, to host a demonstration of tele-surgical capabilities during the Prolonged Field Care (PFC) educational session. TATRC's team members included Carl Manemeit, James Beach, Thomas Bigott, Larry Markins and Rebecca Lee from MISL and Mr. Geoffrey Miller, Lab Manager and Research Scientist for MMSV. During the demonstration, Dr. Pamplin provided remote tele-surgical consultation to guide MAJ Vasios in performance of an escharotomy on a simulated patient using video teleconference capabilities broadcast through high bandwidth Mobile Ad Hoc Network radios. This simulation and demonstration addressed the very real needs of military medical providers operating in a PFC environment. An escharotomy is "a surgical incision of the eschar and superficial fascia of the chest or a circumferentially burned limb in order to permit the cut edges to separate and restore blood flow to unburned tissue. Edema may form beneath the inelastic eschar of a full-thickness burn and compress arteries, thus impairing blood flow and necessitating an escharotomy. The incision is protected from infection with the same antimicrobial agent being used on the burn wound." The demonstration, conducted as part of the education session, helped to highlight realistic scenario in which tele-surgical capabilities could be used to help augment a remote provider's skillset and confidence in performance of a procedure. Mr. Miller noted that, "the demonstration also highlights the substantial yet underused capability of telemedicine platforms to provide opportunities for training, skill sustainment and assessment over great distances, linking remote providers with expert mentors across the Military Health System."

Also during this year's SOMSA, Dr. Gary Gilbert, Research Scientist and Lab Lead for TATRC's MISL completed his two year term on the SOMA Board of Directors and transitioned to SOMA Research Committee Chair. Those new responsibilities included chairing the research oral presentations venue, coordinating and overseeing the judging of both the oral research presentations and the scientific posters, and assisting the SOMA President



Mr. Geoff Miller, TATRC's Senior Research Scientist and Lab Manager for MMSV provides a hands on simulation demonstration during the exhibit at SOMSA.

in presenting the awards. This year's awards included plaques presented for the Best Research Oral Presentation and Best Poster, as well as one-year SOMA memberships for the Best Oral Presentation and Best Poster presented by an SOF medic. "Judging some 23 excellent oral presentations and 40 posters was really tough," said Dr. Gilbert, "thank goodness for the willing assistance and help from a volunteer team of judges that included Dr. Francis McVeigh, TATRC's Science Director and Lead for the Virtual Health Support Office; Dr. Jose Salinas, U.S. Army Institute of Surgical Research; TATRC alumnus, Dr. Ron Poropatich, University of Pittsburgh Medical School; and LTC Jeremy Pamplin, MAMC, and TATRC's Incoming Deputy Director."

He concluded, "TATRC personnel greatly benefitted from the many first-rate and relevant talks on all aspects of current and future SOF medicine to include current and future research and acquisition strategies and SOMSA provided significant opportunities for interaction with SOF medical providers and operators. The medic operator vignettes and lessons learned are always most beneficial to our continued understanding of the research challenges associated with the SOF operational environment. The operational telemedicine presentation by LTC Jeremy Pamplin, supported technically by TATRC personnel at the PFC tutorial, was well received by the SOF operators and providers." ■■■

AAMTI Project Spotlight: Human Performance Optimization in a Non-SOF Unit



Physical Therapy Assistant and SPARTA Coach, Ashley Ricks, works with Soldier Athletes to correct functional movement, improving range of motion, strength, and power to maximize performance.

The XVIII Airborne Corps is aggressively working to reduce the impact and frequency of musculoskeletal injuries and have identified a gap in the traditional methods used to physically train our Soldiers prior to injury and following injury rehabilitation. Traditionally, our Soldiers train by running and road marching multiple times a week and incorporate calisthenics that are more focused toward Army Physical Fitness Test success than mission success. This has led to numerous musculoskeletal injuries that are caused by repetition and overuse. After rehabilitation, injured Soldiers are returned to their units where they continue to participate in the same physical training program they left until they reinjure themselves because the previously injured site was not properly reconditioned prior to training.

One solution to this gap is to develop a comprehensive, multidisciplinary Human Performance Optimization Program that focuses on the physical, mental, and spiritual (cognitive) domains in order to better prepare Soldiers with mission-specific physical training and recondition injured Soldiers prior to continuing their mission-specific training.

The XVIII Airborne Corps designed a strength and

conditioning program with the goal of employing a scalable and holistic strength and conditioning program and named the program (SPARTA), the Soldier Performance and Readiness Training Agoge. They started this program as a “bridging” effort by using the PRT Reconditioning Phase to reduce the Soldier Athlete’s number of modifiable risk factors. After conclusion of the program, the Soldier Athlete will be able to return to full active PRT with their unit without limitations, unless stated in a permanent profile. This bridging effort of the SPARTA program is the initial phase of a fully developed and comprehensive Human Performance Optimization Program. SPARTA currently runs out of one of the functional physical fitness centers located on Fort Bragg, but there are plans to develop a functional fitness laboratory.

In order to organize, track, and communicate with the Soldiers enrolled in the SPARTA program, the XVIII Airborne Corps employed Kinduct, a web-based application that could meet these requirements. The software provided the organization with an interactive, individualized solution that extended the relationship between the professional (health practitioner, trainer, coach) and the end user (Soldier Athlete), in turn empowering active





SPARTA Soldier Athletes undergoing a comprehensive initial screen that assesses functional movement, stability, movement control, and aerobic capacity.

participation in their health, wellness and overall performance. The platform complemented the efforts and time that the SPARTA staff provided the athletes and helped to provide broader reach and engagement along with assessment, tracking and monitoring tools for reporting purposes.

SPARTA Soldier Athletes undergo a comprehensive initial screen. The screening entails a functional movement screen, Y-balance test, motor control screen, broad jump, single leg jump, triple jump, medicine ball toss, weighted carry (for time, distance, and load), and the beep test. All of this data is inputted into the software, which based on any athletic limiting factors, develops a tailored training program that can be viewed on the web or smartphone. All of the exercises in the tailored training program come with an embedded video link that explains the exercise in detail.

The Kinduct program has been beneficial in streamlining the process for collection and interpretation of data. The XVIII Airborne Corps have been better able to track progress, or the lack thereof, in participants of the program by creating triggers that will provide notifications if a standard is not met or a threshold is exceeded. The reports feature has provided the capability to transfer data into a spreadsheet and show trends individually and among groups of Soldiers.

The ability to collect data on soreness levels, nutrition, mindset, and sleep habits on a daily basis will be beneficial in the future in determining training frequency and intensity. This would help to identify training sessions wherein Soldiers perform up to, versus below, expectations and potentially establish a correlation. The Kinduct software also allows for utilization of wearable technology to track health metrics that may be beneficial in determining a Soldier's ability to perform. At this time, they are not incorporating this feature, but it could lead to valuable information.

The communication aspect of the software has been useful in

sending reminders to groups of participants rather than having to reach out individually. It also enables the team to schedule and send out notifications for assessment completion, such as the daily wellness journal, without having to manually do it for each Soldier every day.

Funding for this important study came from the AMEDD Advanced Medical Technology Initiative (AAMTI) Rapid Innovation Fund, with management and oversight provided by TATRC. The XVIII Airborne Corps is partnering with Womack Army Medical Center, United States Army Garrison, Fort Bragg, the Ready and Resiliency Training Center, Campbell University, and Methodist University and began planning for SPARTA in July of 2016. They launched the program on 13 February 2017 and incorporated Kinduct, the Athletic Management System, in September of 2017.

Continued use of this programming will further help to build the Soldier Athlete while limiting the amount of manpower involved in executing it. Administratively, the hours involved in running the SPARTA program would be significantly increased if not for software like Kinduct. Future use of software of this nature will be integral in determining the training volume and intensity for a Soldier Athlete. This may lead to improved periodization of the training in terms of physical training to coincide with training tempo for a Soldier's job. This will aide in decreasing the risk of preventable musculoskeletal injury in order to allow the Soldier to carry out the tasks they have been trained to perform.

The intent is to continue to use Kinduct as the athletic management system for the XVIII Airborne Corps. The XVIII Airborne Corps plans to train an administrator in its use to fully implement Kinduct's function, purpose, and intent in order to realize its full capability.

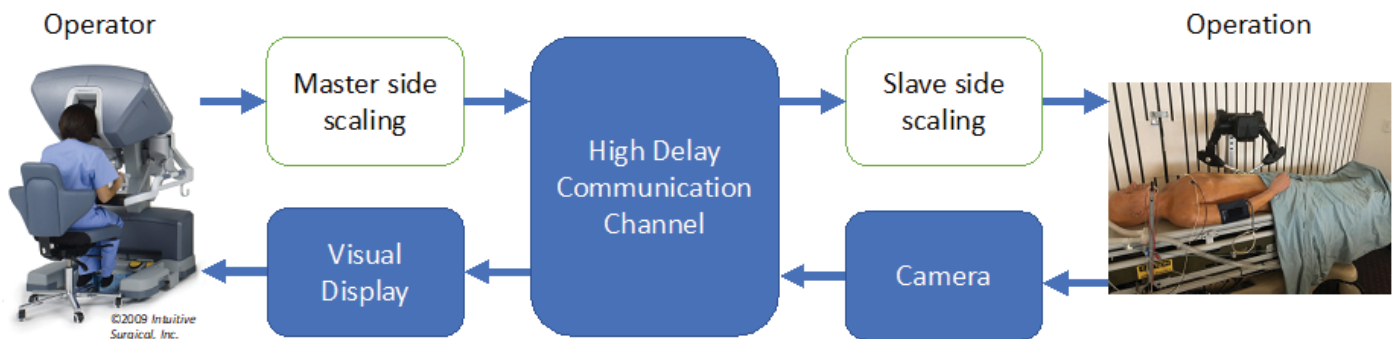
The team paired Kinduct with their SPARTA program to improve combat effectiveness and combat readiness of Soldiers by increasing physical and mental performance, reducing physical re-injury, and decreasing return-to-duty time utilizing a professional and knowledgeable staff providing training in a controlled environment. The Kinduct software assisted in tracking, assessing and monitoring progress of the athletes in the program.

Efforts in military human optimization have lagged in spite of major improvements in equipment. The most common reason for medical evacuations from theater, reported over a three year (2004-2007) period were noncombat musculoskeletal injuries (24%). One study reported over a twenty-two year period (1980-2002) that musculoskeletal injuries accounted for 70% of medical disability discharge rates.

AAMTI Innovator for the study, LTC George Barbee, Deputy Surgeon, Clinical Operations at the XVIII Airborne Corps stated, "Human performance optimization is one of our lines of effort in order to provide ready and responsive forces to the unified combatant commands. The primary outcome of our concerted efforts is a stronger and ardent force, the secondary outcome of our effort will be decreased preventable death on the battlefield." ■■■

AAMTI Project Spotlight: T.R.O.N. Telesurgical Robotic Operative Network and Counter-measures to Excessive Signal Latency in Robotic Telesurgery

Mitigating the Effects of Delay in Teleoperational Systems for Remote Surgery through Scaling



Schematic of Motion-Scaling to counter excessive signal latency in tele-robotic operations

In early 2018, the U.S. Army Medical Department (AMEDD) defined its strategic vision on the role of medical robotics and man-machine interfaces for the future of Army medicine. In line with the Army's Robotic and Autonomous Systems Strategy, AMEDD outlines mid and long-term goals for research and development of strategies to enable semi-autonomous tele-robotic surgery for combat casualty care in austere and combat environments. Currently, the development and implementation of tele-robotic surgical capabilities to support prolonged field care under the Army's future Multi-Domain Battle (MDB) concept faces several challenges.

In the MDB environment, an operational environment involving greater dispersion and near isolation of maneuver units, is likely to cause severe restrictions on mobility for medical missions and shortfalls in both human and materiel resources due to area denial challenges. Combat units will need to be more self-sufficient as delayed medical evacuation becomes increasingly likely due to the freedom of movement challenges imposed by the MDB environment. These scenarios will require patients to be held for longer durations near the point of injury with limited medical resources. The implementation of tele-robotic surgery has the potential to bring advanced procedures further forward in the battlefield by allowing surgeons to remotely perform the types of interventions necessary for preserving life, preventing morbidity, and improving outcomes. However, employment of tele-robotic surgery in the battlefield is currently not feasible due to the operational communications challenges of limited bandwidth, latency, and loss of signal in the deployed combat

environment. These types of communication challenges are likely exacerbated by the MDB environment. Identification and evaluation of the methods to mitigate these communications challenges which hamper tele-robotic surgery are required to enable safe and effective tele-robotic technologies for future forward surgery applications on Multi-Domain Battlefields.

Latency is an especially unique challenge with tele-operated surgical systems because of the bi-directional nature of communications, the need for real-time communication of commands and immediate feedback. Signal disruption or latency carries significant ramifications because it leads to robotic overshoot, oscillations, and instabilities. Without appropriate compensation and safeguards for signal latency, the surgeon's inability to view and control the robot in real-time prevents the safe implementation of telerobotic surgery. With the goal of enabling safe and effective telerobotic surgery for combat casualty care, our team set out to identify and evaluate the problems caused by signal latency in telesurgical robotics, and to develop solutions that effectively act as counter-measures to mitigate these problems. With support from the AMEDD Advanced Medical Technology Initiative (AAMTI) Rapid Innovation Fund, we studied one potential solution by modifying motion-scaling (MS) of the robot to identify optimal degrees of MS that produces the best performance outcome under different latency constraints.

In this study, we used a Da Vinci robotic manipulator to perform a simple task transferring a rubber ring between

AAMTI Project Spotlight

T.R.O.N. continued on page 15



AAMTI Project Spotlight***T.R.O.N.*** continued from page 14

multiple pegs under different delay and MS combinations. We were able to demonstrate in our study that increasing signal delay causes a significant decrease in task performance and increase in task time. Additionally, our novel technique of decreased MS and velocity-based MS under increased signal latency conditions demonstrated statistically significant improvements in task performance.

As we move forward, we plan to utilize the information we have learned from this project and apply it as one of many solutions to enable safe and effective robotic telesurgery. As in prior research and development efforts in robotic telesurgery, the DoD will need to lead the research efforts. Our next step is to have TRON team members from multiple military medical centers closely collaborate with renowned DoD and civilian research institutions such as TATRC, ISR (Institute of Surgical Research), University of California San Diego (UCSD), Stanford, and SRI International to create telesurgery research hubs to explore other potential counter-measures such as development and incorporation of machine learning algorithms for greater robotic autonomy, improving robotic perception capabilities, and development of virtual man-machine interfaces to enable low-bandwidth tele-robotic surgery.

The participation of multiple DoD and civilian research hubs in the development of semi-autonomous protocols for robotic telesurgery is critical as this allows for true, real-time development and testing across vast geographic distances between multiple hubs. Additionally, development of machine learning algorithms for autonomous systems depends on large volumes of relevant data. Engaging multiple institutions allows for the scalability needed for this effort and having military surgeons and DoD research centers leading such efforts ensures that the data collected, and any future designs are tilted towards combat care applications.

The unique infrastructure of the global military treatment facilities including universal licensing, credentialing, and collaborative culture would serve as the perfect incubator for telesurgery. As the TRON project catalyzes the clinical application and ubiquitous adoption of robotic telesurgery within military medicine, there is an opportunity to establish military medicine as a paragon of robotic surgery excellence. The development of semi-autonomous telesurgery is the essential innovation to meet the present and future challenges unique to military medicine.

This project is a combined, collaborative initiative between Walter Reed and National Capital Consortium, Tripler, Madigan, Balboa Naval Medical Center, San Antonio Army Medical Centers, SRI International, UCSD, and Stanford University. ■■■

TATRC Goes Dutch — Medical Officers get VIP Tour and Demo



From left to right: Mr. Ron Yeaw, Mr. Harvey Magee, Dutch military officers, Lt. COL Eric Onnouw, COL Albert Riedstra, Lt. COL Marc de Bruijn, Mr. Nate Fisher, & Mr. Tom Bigott after touring TATRC's facilities

On 6 June, TATRC had the distinct honor of hosting three Dutch Military Medical Officers, representing the Netherlands Surgeon General's office. COL Albert Riedstra, Lt. COL Eric Onnouw, and Lt. COL Marc de Bruijn were on site to visit USAMRMC, and came to TATRC specifically to learn about Virtual Medicine, Operational Medicine, Robotic & Autonomous Systems, and Medical Modeling & Simulation.

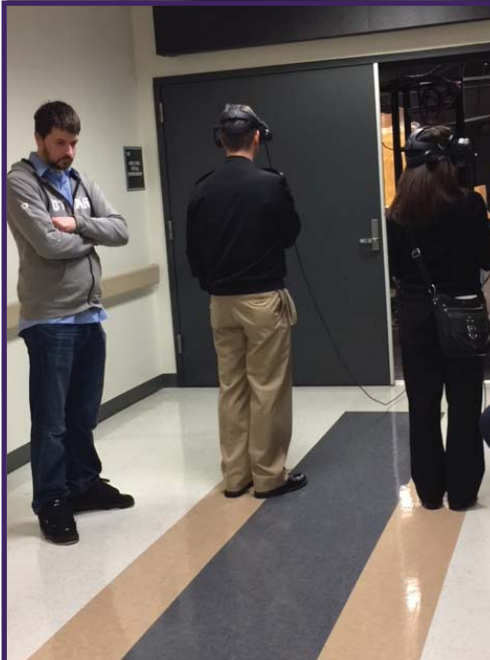
RADM Colin Chinn, former Deputy Commander, USAMRMC, was instrumental in facilitating this international visit. RADM Chinn is part of the NATO COMEDS (Chief of Medical Services), as the U.S. representative and serves as the Joint Staff surgeon at the Pentagon, as well as the chief medical advisor to the chairman of the Joint Chiefs of Staff, providing advice to the chairman, the Joint Staff and the combatant commanders.

At the December 2017 COMEDS, the U.S. and Netherlands Surgeons General had a discussion about the Dutch having an interest in U.S. R&D along with other technology for military medicine and wanted to see what best practices they could apply to their country's military.

These opportunities to interface with other Nations are invaluable to the future of Military medicine and technology, and we were thankful to be part of the agenda!

Thanks to TATRC's Acting Director, Mr. Tim McCarthy and our Subject Matter Experts, Mr. Ron Yeaw, Mr. Tom Bigott, Mr. Nathan Fisher, and Mr. Harvey Magee for the hands on, interactive demonstrations and for sharing their knowledge and expertise in their respective fields! ■■■

TATRC's JMedSIM Initiative is Off and Running



During a tour of USU's Val G. Hemming Simulation Center, team members experienced a virtual reality game created specifically for simulation training.

Two of TATRC's Labs recently joined forces to kick off the Joint Medical Simulation Instructional Methods (JMedSIM) initiative. The Medical Modeling Simulation & Visualization (MMSV) team, along with key members of the Health Technology Innovation Center (HTIC), are actively collaborating with the J7 for the Defense Health Agency to provide not only a web application, but also to create standardized content to help assist operators and educators at medical simulation centers. This effort will become the JMedSIM and JMedSIM Portal.

The efficacy of healthcare simulation activities for learners depends on the knowledge and skill of the instructor and the simulation operations specialist. Most instructors/operators have on-the-job training and a few have attended civilian courses in healthcare simulation. Due to frequent turnover of staff, this project will produce a series of comprehensive simulation instructor/operator courses that can be delivered to most personnel who are responsible for conducting simulation based medical training and healthcare education.

A joint team was convened in February to begin defining the requirements for the portal. TATRC, using an Agile Project Management Framework, facilitated the discussions to elicit user stories that would be used to plan and build out the portal. The team actively engaged in this meeting by separating out the differences between the portal for the Medical Simulation Operations staff and the learning management system for end users. The team agreed that the portal would be

a secure, sharable, searchable database of simulation materials to create sharable simulation resource materials for use across the Military Health System using metadata standards. TATRC's HTIC development team is currently working on this portal, and will have an early demonstration ready for the JMedSIM Working Group to review early this summer.

The JMedSIM team, led by Mr. Geoffrey Miller from TATRC's MMSV, reconvened the group at large in San Antonio, TX for several days in April to define a standardized course outline for a foundations course, an operator's course and an environment/equipment course. This joint, tri-service team will use the outlines to further develop the content during the upcoming months with multi-media A/V support provided by TATRC. While the April meeting concentrated on the simulation centers operations, a June meeting focused on course content for medical simulation educators.

Over the course of the three-day meeting, stakeholders gathered to collaborate on the development of the Portal. The working group defined portal requirements and met to discuss the simulation scenario template, role-based functionalities, and established what common lexicons will be used.

Future, subsequent meetings will continue throughout the summer focusing on continuous portal development and feedback, as well as refining and finalizing course content.

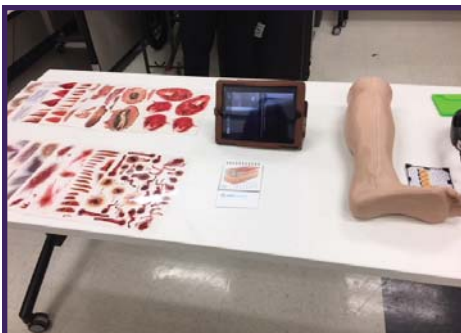
Ruben Garza, Director of Defense Medical Modeling & Simulation Office (J7) stated, "On behalf of DHA Education &

JMedSIM continued on page 17



JMedSIM continued from page 16

The TATRC Team looked on during a simulated tracheotomy at Val G. Hemming Simulation Center



Different examples of moulage tattoos that could be used for various training scenarios.

Training (J7), sponsoring this JMedSIM effort will provide the necessary support to our MHS operators and instructors. This much needed effort will enable, from our novice personnel to perform basic training simulation modalities, to our experienced personnel by enhancing medical training. JMedSIM will provide basic, intermediate and advanced, on-line or in-person courses. We're excited that this new effort lies with TATRC and look forward to partnering with TATRC's dynamic team." ■■■

New CRADA Agreement in Place with Sensogram Technologies, LTD

The Operational Telemedicine team under TATRC, pursues research objectives that support medical data exchanges of information for Tactical Combat Casualty Care (TC3) in the Prolonged Field Care environment to enhance the delivery of healthcare by military medical personnel from the point of need throughout the continuum of care in the operational environment to a Role III facility. The enhancements range from capabilities local to the care provider, virtual health initiatives, as well as cloud-based data exchanges. Examples of local capabilities include the ability for a care provider to be able to monitor multiple patients with small medical devices, such as the different technologies within the SensoTOUCH Platform family, that help populate care documentation, inform medical decision support systems, and exchange of the medical information with other local and remote medical providers. The virtual health initiatives would utilize the information gathered at the local level to accurately inform remote medical specialists and experts of a patient's condition in a rapid fashion. This would maximize teleconsultation or telementoring data exchanges, versus exchange of patient condition information that is required to inform the medical direction and guidance. These data exchanges would occur over cloud-based technologies that provide additional benefit in ease of dissemination of information as well as reducing the maintenance footprint.

In August 2017, TATRC completed a Cooperative Research and Development Agreement (CRADA) with Sensogram Technologies to conduct an early evaluation of the SensoTOUCH platform's Ring form factor in a military representative field environment to assess the suitability of technologies under development and to obtain feedback from uniformed military medical personnel. One test participant wrote, "Size, BP/P/R/SpO2... [in] The Ring... Wow! This is awesome!" Needless to say, the SensoTOUCH platform was received positively by the uniformed military medical personnel, resulting in the desire for continuation of additional cooperative research to assess the SensoTOUCH



Figure 1, The Ring Form Factor of the SensoTOUCH Platform

platform in different environments.

With support from both the U.S. Special Operations Command (SOCOM) and Project Manager, Medical Evacuation Mission Equipment Package, TATRC and Sensogram Technologies formalized the follow-on CRADA on 21 November 2017 and formed a working group consisting of other DoD partners. These partners include the SOCOM, U.S. Army Medical Evacuation Proponency, U.S. Army Medical Material Agency, U.S. Air Force Research Laboratory's BATDOK program, and the Naval Surface Warfare Center Dahlgren Division.

In addition to utilization of the small form factor SensoTOUCH platform for physiological status monitoring, TATRC is planning to explore the use of the SensoTOUCH platform for patient identification and for transfer of patient medical information contained in the electronic Tactical Combat Casualty Care (TC3) card. TATRC is working with the different Department of Defense partners to conduct research events to assess the SensoTOUCH platform in operational environments. With approved Defense Health Program 6.7 funding and sponsorship from Program Executive Office Aviation, TATRC will be able to further assess the military utility of the SensoTOUCH platform as a small form factor physiological status monitor in military exercises, such as Island Marauder and the upcoming Network Integration Exercise as part of their AeroMedNet initiatives. ■■■

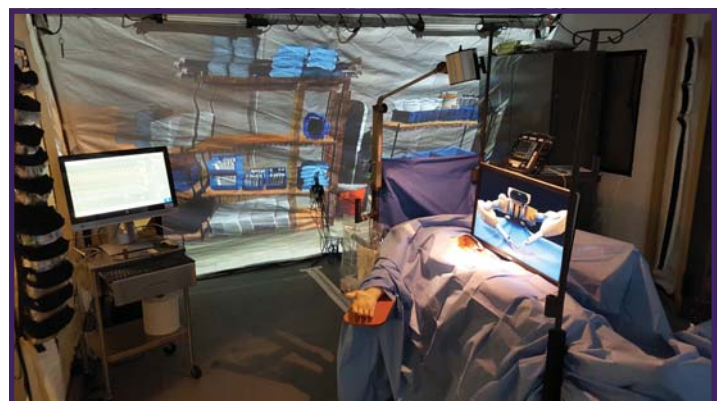
TATRC Looks to the Future with New Simulation Environment



A peek inside TATRC's new Medical Modeling, Simulation & Visualization Environment.

TATRC's simulation team has completed the first phase of a new capacity and capability for research, development and analysis, a medical modeling, simulation and visualization environment (MMSVE). Following last year's successful TATRC open house, a proposal was submitted to TATRC Director, COL Dan Kral, by the Medical Modeling, Simulation and Visualization (MMSV) team. The proposed idea to develop a permanent, simulated military medical setting to replicate the Role 1 and 2 environments was accepted and is well underway. This new testing environment is located right here at TATRC, within the Innovation Campus' field tents. The MMSVE is intended to support the widest possible range of TATRC research efforts, providing a realistic testing ground for past, current and future research efforts, encouraging cross-domain and laboratory collaboration.

The new MMSVE will allow TATRC research efforts to more fully explore and analyze projects during all stages of development. This capability offers the opportunity to rapidly test research and development



An example of the immersive capabilities the MMSVE provides for research and testing here at TATRC.

efforts, make iterative improvements of these efforts and potentially accelerate the efficiency, desired end-state of lines of research and their interoperability with existing and complementary research efforts throughout TATRC and its partners. The MMSVE incorporates the ability to model, simulate and visualize (Table 1) research and development projects in more realistic operational



Modeling, aims to describe how something behaves to gain some understanding about the system represented by the model.

Simulation, builds on models and facilitates changes to the model as a means to observe it over set periods of time or activities. Thus, the term “simulation” is defined as models that have been implemented in a temporal manner. Specifically, these simulations can take on three forms: live, virtual, and constructive simulation. Live simulation is real people using real equipment but employing the equipment outside the context of a real world. Virtual simulation consists of real people employing simulated equipment. Constructive simulation involves simulated people working with simulated systems. Importantly, these simulation forms are not restricted to exist in isolation. Combining them can produce a simulation environment known as live—virtual—constructive (LVC) simulation, which is well known and established in many military domains.

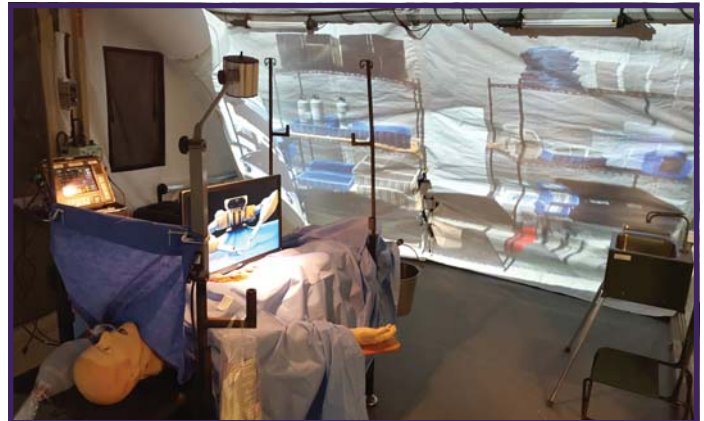
Visualization, serves as the means by which information is communicated. This information can be the result of a simulation or a representation of a physical object being simulated inside the simulation. When the visualization is effective, it enables the understanding of complex relations of large amounts of data with ease. Visualization tools can also animate computational outputs for analysis, prediction, and prescription.

Table 1. Modeling, Simulation and Visualization definitions (adapted from Combs, 2016)

environments.

TATRC’s new MMSVE adds an additional 800 square feet, and includes two simulation spaces, and areas for pre-briefings and after action review. The laboratory will also be outfitted with a comprehensive audio-visual system to allow for video recording and archiving, as well as the capability to create immersive virtual environments, sounds and other environmental characteristics.

The MMSVE provides several full-bodied, computer-driven human patient simulators, capable of simulating a wide array of medical conditions and injuries. The simulators can be used for testing and experimentation of current and future technologies, procedures and interventions for military health needs. The lab will also provide a variety of partial task trainers. The laboratory is outfitted with equipment sets for combat medics and the majority of Role 1 and 2 care needs. The MMSVE



Another example of the immersive capabilities within the MMSVE at TATRC.

also provides an operational telemedicine lab, accredited medical information center, allowing for testing of prototype secure communications and data devices. These capabilities can further be integrated to allow for multi-lab concepts testing and systems modeling and simulation, to evaluate research efforts across the entire casualty care spectrum.

With all of these new capabilities, the MMSVE provides new and enhanced opportunities for TATRC’s research and development activities, specifically, the ability to perform early-stage testing of research programs, the ability to conduct comprehensive evaluation and analysis of funded research efforts, and promotion of integrated, collaborative research and development activities both intramural and extramural, across multiple labs. “This investment represents an exciting opportunity for the labs at TATRC to work together bridging our research efforts in a simulated military environment. We now have an environment to support military medical modeling, simulation and visualization of current and future research and development activities from the point of injury through the entire telemedicine environment,” stated Mr. Geoffrey Miller, MMSV Lab Manager and Research Scientist.

References:

C. D. Combs, John A. Sokolowski, Catherine M. Banks (2016). *The Digital Patient: Advancing Healthcare, Research, and Education* (Wiley Series in Modeling and Simulation), pp 35-38. New Jersey, John Wiley & Sons, Inc., ISBN: 978-1-118-95275-7. ■■■

AAMTI PM Visits Madigan's Annual Research Day

Ms. Holly Pavliscsak, TATRC's Program Manager who oversees the AMEDD Advanced Medical Technology Initiative (AAMTI) was on the road again in May. This trip took her to Madigan Army Medical Center (MAMC) in Tacoma, Washington where she attended the Colonel Pat C. Kelly Madigan Research Day on 4 May. COL Richard Burney, Chief of the Department of Clinical Investigations hosted this impressive event. This annual event is a day that is chock-full of presentations to celebrate and recognize the outstanding work of Madigan research investigators.

Podium presentations were broken up into three sessions: pre-clinical, staff and prospective / retrospective. There were fifteen podium presentations delivered during the day and five of those podium presentations had previously received AAMTI funding. Numerous scientific posters lined the halls and case reports and original research posters were also featured. Several AAMTI projects were represented there as well.

The AAMTI Program had a banner day at the Madigan Research event not just in overall representation, but 2 AAMTI Projects that were presented won awards in excellence and their presenters received Army Achievement Medals (AAM) for their mission-critical work. CPT Rowan Sheldon won Top Podium Presentation for the preclinical session for his presentation on *"An Evaluation of Novel Medical Devices and Other Interventions in the Treatment of Tension Pneumothorax in a Swine Model (Sus scrofa)."* While CPT Morgan Barron, won top poster presentation for his poster entitled, *"Mobile Forward Looking Infrared Technology Allows Rapid Assessment of Resuscitative Endovascular Balloon Occlusion of the Aorta in Hemorrhage and Blackout Conditions."*

Ms. Pavliscsak is honored to be invited to this event every year and is always so impressed with the visionary work that is consistently fostered at MAMC. COL Burney shared with Ms. Pavliscsak while she was onsite that two of his AAMTI- funded projects have pending patents. The atmosphere at MAMC continues to reverberate excellence.

Ms. Holly Pavliscsak stated, "The best days are when I get a chance to meet the medical professionals that the AAMTI Program funds face-to-face, and learn firsthand about their innovative projects. Their excitement and endless energy embodies what the AAMTI Program is all about - supporting Innovators within our Medical Treatment Facilities who are striving to improve access, quality, cost and readiness! The concentrated representation of AAMTI funded projects that were presented and awarded here at the COL Pat C. Kelly Madigan Research Day demonstrates that the AAMTI program continues to be right in the crosshairs of innovation and value."

Examples of AAMTI-funded research that were featured and recognized at the event include:

AAMTI-Funded Podium Presentations:



An Evaluation of Novel Medical Devices and Other Interventions in the Treatment of Tension Pneumothorax in a Swine Model (*Sus scrofa*), presented by CPT Rowan Sheldon, Associate Investigator.
** Top presentation: Preclinical session



Life Saving Surgical procedures in Blackout Conditions Using Night Vision Technology: Come to the Dark Side, presented by CPT Michael Derickson, Associate Investigator.

Annual Research Day continued on page 21



Annual Research Day

continued from page 20



Leveraging Technology to Personalize Resistant Hypertension Management (TEAM-HTN), presented by Dr. Highley, Collaborator for LTC Leilani Siaki, Principal Investigator.



Cilia-associated Genes are Upregulated in the Endometrium of Women with Ectopic Pregnancy, presented by CPT Jessica Lentscher, Associate Investigator.



Virtual Health: A Force Multiplier for Operational Medicine, presented by LTC Jeremy Pamplin, Principal Investigator.

AAMTI-Funded Poster Presentation:



Mobile Forward Looking Infrared Technology Allows Rapid Assessment of resuscitative Endovascular Balloon Occlusion of the Aorta in Hemorrhage and Blackout Conditions, presented by CPT Morgan Barron, Associate Investigator.

****Top poster presentation: Original Research category**

Esprit de TATRC at 23rd Annual Organization Day

Family, Friends, Fun, and Fabulous Food. All were in abundance at this year's 23rd annual TATRC Organization Day & Summer Picnic! For years now, Team TATRC has rallied on Nallin Pond for a day of teambuilding, camaraderie, and good old-fashioned cookout fun! The "Org Day" allows a chance to look back on the progress made over the past year, as well as a look forward to see what's in store for TATRC in the near-future. This year was bittersweet as the Team officially said "Farewell" & "Thanks" to COL Dan Kral, the organization's Director of 5 + years, who is preparing to retire in the next few months. After a fun lunch, Mr. Timothy McCarthy gave a heart felt speech and presented him with a gift on behalf of the entire organization. However, it wasn't all business as the day progressed to rousing matches of corn hole throwing, relay races, bean bag tossing,



TATRC's Acting Director, Mr. Tim McCarthy presents parting gifts to former Director, COL Dan Kral.

and, of course, water balloons! As always, this year's event was a big hit, and the team looks forward to celebrating future progress at next year's 24th Annual Organization Day & Summer Picnic! Thanks to all who made this event a great success and Happy Summer! ■■■

Military Integration & Utility Evaluation of Telemedicine Capabilities over 4G LTE Manpack Radios

TATRC's Medical Intelligent Systems Lab (MISL) entered into a Cooperative Research and Development Agreement (CRADA) with CORNET Technologies on 4 June. The purpose of the CRADA is to explore the possibilities of integration and utility of Virtual Health capabilities over a heterogeneous radio network consisting of CORNET Technology's STINN LTemp Manpack 4G LTE Deployable Base Station for local 4G LTE communications and longer range communications provided by other radio technologies, such as Mobile Ad Hoc Network (MANET) radio systems and Broadband Global Area Network (BGAN). In addition to supporting localized 4G LTE networks, the STINN LTemp Manpack 4G LTE also provides a ruggedized server platform with Intel's Core 7 processors.

CORNET Technology has already successfully performed demonstrations of high bandwidth data transfers in a heterogeneous radio network consisting of 4G LTE Manpack radios providing bubbles of service locally with the nodes being connected through longer range MANET radio systems. CORNET Technology supported high definition video suitable for tele-surgical consultation from a distance of 5 miles in recent demonstrations through the use of the heterogeneous radio network. This CRADA will allow for the military to further validate the different medical use cases for this type of technology. The Principal Investigator for this CRADA, MISL's Mr. James Beach, stated that "employment of this [high bandwidth network] capability into simulated



CORNET Technology's STINN LTemp Manpack 4g LTE Deployable Base Station (Cell Tower in a Rucksack)

operational environments will allow for identification of unforeseen virtual health capabilities."

Current plans include incorporating the 4G LTE Manpack capability into TATRC's Research Evaluation Event taking place this August at Fort Detrick, to perform research into the military utility of the capability with a wide range of virtual health research projects, ranging from mobile healthcare documentation to simulated tele-surgical scenarios. TATRC has also engaged with other military partners to further evaluate use of heterogeneous networks with 4G LTE nodes to perform virtual health in remote isolated military medical scenarios.

Future plans under consideration would explore the use of the integrated processing power within the 4G LTE Manpack to support services for local users. The services would range from providing computing power for potential decision support algorithms for clinical purposes, or to host localized web-based services for applications requiring computing power not found in Android-based End User Devices. ■■■

New Virtual Health Research Task Area Will Commence in FY19

At the beginning of FY19, TATRC's Ms. Jeanette Little will serve as the Capability Area Manager for a new Research Task Area in Virtual Health aimed at far-forward, beyond FY2035, battlefields. This exciting new research opportunity falls under the Army Medical Simulation and Information Sciences Research Program portfolio. The nature of this research is Army 6.2 funding, that is applied research, which is defined as "systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met."

The focus of this research is to support the medical needs of the far-forward Multi-Domain Battlefield. Considerations for virtual health to support in prolonged field care scenarios and limited and/or non-existent communications due to electronic warfare are key aspects of this research funding. Mr. Ron Yeaw,

Virtual Health Task Area Project Officer, stated, "This is an exciting opportunity for TATRC to really look beyond the next generation of capabilities into the art of the possible. Setting the foundational grounds for research to be realized in FY2035 will take vision, strategic partnerships, and true imagination. Fortunately, this is where TATRC excels."

The first year of research funding for this program is intramural in nature, and four specific research projects have completed the peer review and IPT selection process and are in the final stages of consideration for funding. Formal announcements of the funded projects are expected shortly.

For FY20, research proposals will be accepted from both intramural and extramural sources, and the request for proposal is expected to be announced in early July 2018. ■■■



TATRC Staff Participates in AHS Mission Command & Interoperability in MDB Seminar

Two key staff members from TATRC's Medical Intelligent Systems Lab (MISL) were invited as guest speakers to present at the Army Health System Mission Command and Interoperability in Multi-Domain Battle (MDB) Seminar, 3-6 April, at the Health Readiness Center of Excellence (HRCoE) at Joint Base San Antonio, TX.

The purpose of the seminar was to inform the Army Campaign of Learning leadership that focuses on achieving overmatch in a MDB through enhanced interoperability with joint, inter-organizational, and multinational (JIM) partners. This event explored Joint Interagency Multi-National (JIM) health system interoperability for medical mission command, plans and operations, treatment, evacuation, logistics, patient movement and medical regulation during MDB.

There were about 60 seminar participants which included diverse representation from the Army, Air Force, Navy, and Marine Corps in addition to participants from the United Kingdom and Australia. There were over 20 presenters to include a British Liaison Officer and an Australian Exchange Officer. MG Brian Lein, Commanding General, AMEDD Center & School, HRCoE, kicked off the four-day seminar.

Seminar participants received high-level plenary information briefs and participated in facilitated working groups. Facilitators led discussions capturing comments and insights to support the seminar end-state and outputs.



importance of integration of medical capabilities with multi-purpose Army RAS platforms and the need to promote system interoperability and information exchange not only between medical and non-medical assets, but also between U.S. forces and JIM partners to successfully address some of the challenges imposed by the MDB concept.

Mr. Thomas Bigott, the Research and Development Information Technology Project Manager provided a detailed presentation entitled: "Ongoing Research in Operational Telemedicine at the Tactical Edge" focusing on MISL's past and ongoing research in data collection at the point of injury (POI), medical communications prototype technologies for the theater – moving casualty information from POI to a theater cloud-based electronic health record thereby making that information available to Theater medical personnel; as well as the organization and ongoing efforts of TATRC's Virtual Health Support Office to support the Army Surgeon General, CONUS and OCONUS Virtual Health and operational telemedicine applications worldwide. Mr. Bigott stated, "This was an important seminar for TATRC to attend and be a part of as the seminar focused on expected technologies for the U.S. military between 2030 and 2050. Typically, TATRC has developed technologies with a five to ten year horizon; with its new orientation on technology research for 2030 and beyond, TATRC is also now focusing on more visionary technologies for which research must be initiated decades before they are used in combat." ■■■

The seminar focused on six key objectives that included:

- Examine mission command and interoperability challenges to include varying interpretations of interoperability, differences in mission command, culture, and language
- Determine areas required for JIM health system interoperability for MDB to include protocols and policies; compatibility; and requirements for standardized training, skills maintenance and credentialing
- Identify requirements for JIM uninterrupted mission command and an integrated Medical Common Operating Picture
- Identify forward medical capability requirements for MDB
- Identify early entry medical capability requirements for MDB
- Identify opportunities to explore and exercise JIM health system interoperability

Mr. Nathan Fisher, Project Manager for Medical Robotic and Autonomous System (RAS) briefed the potential operational benefits of utilizing future RAS systems for medical applications within the MDB operational framework. He stressed the

TATRC Briefs at the Army Marine Corp C2 / SA Convergence IPT

Two members of TATRC's Medical Intelligent Systems Lab (MISL), Mr. Carl Manemeit and Mr. James Beach, briefed the Army-Marine Corps (A/MC) Command, Control and Situational Awareness (C2/SA) Convergence Systems Engineering Integrated Process Team (IPT) on Operational Virtual Health research concepts. The A/MC IPT was chartered by the 3-Star Army Marine Corps Board's General Officer Steering Committee (GOSC) as an investigating body to review all C2/SA systems cross Service coordination efforts and to report back twice a year on all convergence and divergence issues to the GOSC. The IPT has covered issues from Air and Ground topics, to platforms, handhelds, transports, networks, coalition, and data standardization, covering a wide array of topics that cut across the Army and Marine Corps and pulls in the Navy and Joint Staff as well.

TATRC's presentations informed the IPT on the future research concepts in virtual health that require tactical network connectivity to supply provider to provider teleconsultation for medics in isolated, austere environments, during prolonged field care, and en route casualty evacuation. The briefing also covered medical understanding of the future concept of a multi-domain battlefield, the challenges of timely evacuation of casualties from the battlefield, and prolonged field care where medics will have to treat casualties longer at the point of need. The near peer enemies in symmetric warfare, dispersed operations, and anti-access/area denial resulting in prolonged field care will push medical personnel to work well-beyond their license and training. These virtual health capabilities that are dependent on

reliable communications, will help address the gap between the required patient care and the medic's skill set.

The operational virtual health projects presented to the IPT are reliant upon the tactical and operational networks. With reliable networks having sufficient bandwidth, remote casualty monitoring with Artificial Intelligence assist applications in the future will provide medical support to medics during prolonged field care, en route casualty evacuation, and during Remote Autonomous Systems extractions. Continuous monitoring and transmission of medical data through the tactical and operational networks will become essential in providing near real-time medical situational awareness for informing medical direction and guidance from remote clinical specialists. The electronic documentation will be transmitted into the casualty's permanent electronic health record to inform near-term and long-term clinical decisions. The research included an overview concept of operation of micro-cloud connectivity at the Brigade level and lower to capture electronic DD 1380 tactical combat casualty care encounter that can be uploaded into Legacy electronic health records and future GENESIS electronic health records, and physiological monitoring capability that stream medical vital signs data, imagery, voice, and documentation. Through networks with sufficient bandwidth for tactical voice and video services, the capability for the medic to reach out to a surgeon via a tele-surgical consultation has the potential to provide lifesaving capability.

"The benefits of participating in this meeting was that we were able to provide other attendees with a broad overview of knowledge for future medical requirements on the tactical network architecture. Some of this hadn't been presented from the medical perspective before, so there was keen interest and active engagement during our time at this IPT," stated Mr. Carl Manemeit, Deputy Lab Manager for MISL. ■■■

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Virtual Health Support Office (VHSO) Corner

What Have You Done for us Lately?

As a reminder, the mission of TATRC's Virtual Health Support Office (VHSO) is to support the Office of the Surgeon General's (OTSG) Virtual Health Office and other Army personnel involved in current operational virtual health initiatives. The VHSO Team continues to reach out to and work with the OTSG Army Virtual Health Office, the Regional Health Commands' Teams, OTSG staffs, and deployed providers, administrators and IT personnel to ascertain how we can best help them accomplish their missions.

Our colleagues are doing a phenomenal job, but are being asked every day to do more with less. Many of these folks are focused on the Garrison aspects of virtual health with a few exceptions. Collectively, we understand that the Garrison and the operational virtual health aspects will one day be one overarching system, and as such we need to begin working on the synchronized efforts now. The virtual health goal remains unchanged, 'reachable at anytime from anywhere when needed.'

We, the VHSO Team at TATRC, consider ourselves 'Augmentees' (IAW Merriam Webster: an augmentee is a member attached to a unit as a temporary duty assignment who can be used to fill shortages or can be used when an individual with specialized knowledge or skill sets is required.). We maintain a continuous dialogue with our colleagues and actively engage with them through actionable efforts. Most recently, the VHSO Team met with representatives from the OTSG Virtual Health Office, Virtual Medical Center, Regional Health Commands and others to help further understand how we could best support them.

Some of the issues and needs identified during our discussions were: documentation of operational virtual health encounters; developing a Return on Investment (ROI) for the Pacific Asynchronous Telehealth Program (PATH); transitioning the Advanced Virtual Support for Operational Forces (ADVISOR) initiative oversight to the Virtual Medical Center; updating and verifying the accuracy of the 'One Page, How to Use' Virtual Health Instructional Sheets to be posted on the Special Forces' websites.

More specifically, the following are the VHSO's actionable responses to the above issues:

- Developing automated documentation and tracking tools for the Virtual Medical Center's use for ADVISOR, and Regional Health Command - Europe for operational virtual health encounters.
- Assisting with ADVISOR transition to the Virtual Medical Center by building out the current tracking file through December 2018, and assisting with the setup

of the current Excel data for transfer to an Access database platform framework to allow for future growth and flexibility.

- VHSO is gathering input from each Regional Health Command's Virtual Health Team, and the Virtual Medical Center, as well as working closely with the OTSG's Virtual Health metrics personnel, to create a comprehensive list of all suggested criteria to be measured and tracked for Operational Virtual Health Encounters. The finished product will be given to the OTSG Army Virtual Health Office who are responsible for creating surveys and tracking metrics. Please note that the Garrison virtual health encounters and related statistics are very well documented and tracked.
- Developed and released the VHSO SharePoint Operational Telehealth Dashboard that is for public reference. The data is shared with others who are engaged in virtual health.
- Identifying and accessing data within various patient documentation systems to be used for calculating ROI for PATH.
- Serving on MHS Telehealth Work Group Sub-Working Groups (Education/Training Sub-Working Group, and the Coding, Analytics and Metrics Sub-Working Group).
- Continuing to expand the CENTCOM TH (formerly TBH) Coordination initiative.
- Updating and verifying accuracy of the 'One Page, How to Use' Virtual Health Instructional Sheets for capabilities such as, PATH/HELP, ADVISOR, Tele-Health In A Bag and others to be posted on the Special Forces' websites.

The VHSO Team continues to oversee, coordinate and connect personnel to address current operational virtual health initiatives and concerns in the deployed settings throughout several COCOMS. Additionally, VHSO is broadening the types and scope of virtual health encounters in the operational environments to include reaching out to the Navy and Air Force points of contact. Lastly, the VHSO is not in this alone—we work closely with individuals from the Regional Health Commands; Virtual Medical Center; OTSG's Signal and Virtual Health staffs; and deployed providers, administrators and IT personnel.

Dr. Francis McVeigh, VHSO Lead and TATRC's Science Director, reminded us, "the VHSO's motto is, 'One Team One Fight' and we firmly believe, 'If you want to go fast—you go alone, if you want to go far—you must go with others.'" ■■■

Virtual Medical Concierge Application Completes SBIR Phase II Implementation at Walter Reed

The Virtual Medical Concierge Application (aka “LASSIE”), previously detailed in the September 2017 TATRC Times Newsletter, Volume 3, Quarter 4 edition, completed its prototype roll-out and advanced concept demonstration at Walter Reed National Military Medical Center (WRNMMC) on 28 February 2018. The LASSIE mobile application, developed by Heron Systems, Inc. using Defense Health Agency (DHA) Small Business Innovative Research (SBIR) Phase II funds, is a near-production ready prototype that provides WRNMMC patients, staff, and visitors the ability to navigate the complex WRNMMC outpatient facility using their personal Apple or Android phones. Over 300 American Red Cross volunteers and salaried “Blue Coat” patient relations representatives evaluated the prototype and made salient recommendations for improvements.

LASSIE’s users are provided with a map and text or voice-based turn-by-turn directions to find their way throughout the facility. Heron Systems installed over 300 Low Energy Bluetooth Beacons in the WRNMMC outpatient and ancillary service areas. The Bluetooth Beacons work with the users’ mobile phones to provide navigational support. This capability has been particularly useful during WRNMMC’s ongoing renovation. At present, the Virtual Medical Concierge application is not connected to the .mil network or any Electronic Health Records (EHR) systems, and only provides user way-finding. Future iterations of the project, if funded, would integrate the Virtual Medical Concierge Application with WRNMMC’s scheduling and EHR systems, to provide true context-sensitive, location aware information. For example, a patient might be walking by the pharmacy, and the application would remind the patient to pick up any refills required. Or the application could alert the user that their clinician is running late and direct the patient to a nearby coffee shop. LASSIE could also notify all patients over 50 that the new shingles vaccine has arrived and direct them to the vaccine clinic. Diabetic patients entering the chow hall could be directed towards

healthy nutrition choices. Secondary benefits of the technology include the ability to track small items and equipment using Bluetooth tags.

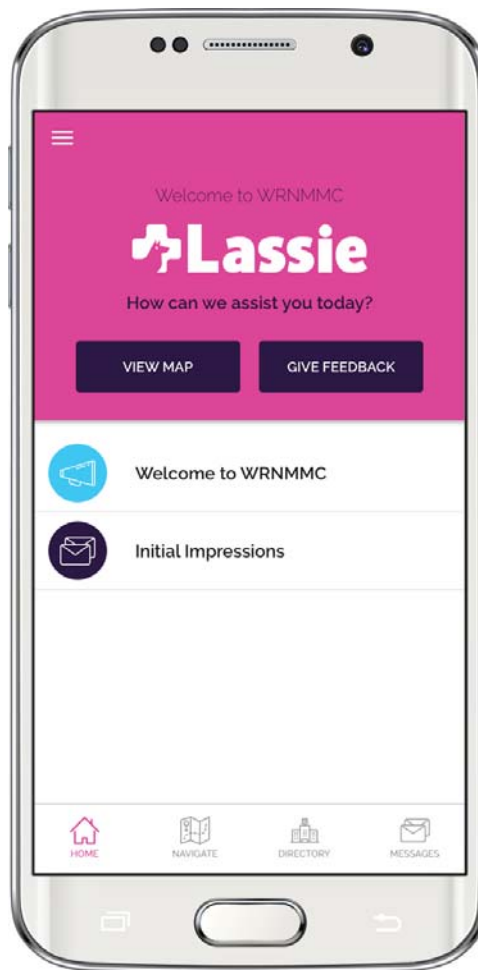
The Virtual Medical Concierge concept was conceived five years ago by Captain Kevin Dorrance, MC, USN, who was head of the WRNMMC Medical Home. Mr. Robert Connors, formerly of TATRC’s Health Technology Innovation Center (HTIC), wrote the SBIR topic and supported Ms. Ollie Gray, HTIC’s Lab Manager, in managing the project. Mr. Connors spearheaded and facilitated communications between Mr. Brett Darcey, Heron Systems, Inc. Vice President, and WRNMMC’s Director for Administration; Director for Clinical Operations; Facility Management, Information Management; Physical Security; and Public Affairs, to make the idea

a reality. Key representatives who were instrumental at WRNMMC included Captain Kevin Dorrance, MC, USN; LTC Kenny Wells, MSC, USA, LCDR Jacqueline Anderson, MSC, USN, Ms. Angela Kinart; Ms. Tonya Reeder; Mr. Jose Izquierdo; CDR Jason Shroeder, MC, USN, and Ms. Staci Harrison. Ms. Regina Julian, Chief, Patient Centered Medical Home Primary Care at the DHA; Mr. Marc Goodge, Chief Technology Officer, DHA; and CDR Mark Becker, MSC, USN, Navy Bureau of Medicine and Surgery, have all expressed great interest in the project.

On 5 March Mr. Darcey, briefed the WRNMMC Deputy Directors who were favorably impressed, and a decision by the WRNMMC Board of Directors on the future of the project is pending. Part of the decision will involve determining which Director at WRNMMC should lead further implementation with patients, visitors, and staff. San Antonio Medical Center and several other military medical treatment facilities are interested in implementing the application in their hospitals. Heron Systems, Inc. intends to submit follow-on SBIR Phase I and Phase II Enhancement proposals to continue to advance the project towards full commercialization.

Mr. Connors, who helped implement the project at WRNMMC, stated, “the

Virtual Medical Concierge Application truly enhances and improves the consumer experience at WRNMMC... As a Navy retiree, I have been receiving my care at WRNMMC for over 20 years and thought I knew how to navigate the facility efficiently. But with all of the new construction, even I was beginning to make navigation mistakes and found myself lost a few times. LASSIE has been my savior in a couple of cases in helping me find the quickest route to my clinic destination!” ■■■



New mHIC Partnership with Army Flagship Hospital Announced



Landstuhl Regional Medical Center, a military hospital operated by the Army and the Defense Department

TATRC's Mobile Health Innovation Center (mHIC) received funding for an exciting Traumatic Brain Injury (TBI) project supporting the Army's premiere OCONUS Flagship, Landstuhl Regional Medical Center (LRMC). This month, mHIC received word that the U.S. Army Office of the Surgeon General (OTSG) had approved the request to fund a joint partnership research study between TATRC and LRMC. The goal of the research will be to determine if traumatic brain injuries can be identified and treated through a Service Members' own smartphone.

According to the Defense and Veterans Brain Injury Center (DVBIC), over 375,230 of TBI have been recorded in Service Members since statistics for TBI first began being recorded in 2000. DVBIC goes on to say that "the high rate of TBI and blast-related concussion events resulting from current combat operations directly impacts the health and safety of individual service members and subsequently the level of unit readiness and troop retention. The impacts of TBI are felt within each branch of the service and throughout both the Department of Defense and the Department of Veterans Affairs health care systems."

According to the National Rehabilitation Information Center, "a home care program can support the rehabilitation program established by the doctor to help the body and the brain heal, and to (re)learn critical activities. One very important element will be educating the individual as well as the family on the home-based rehabilitation process." The goal of the TATRC-LRMC study is to do just this.

Through a series of neurocognitive tests, an existing commercial off the shelf (COTS) mobile app has shown capacity to detect and categorize levels of concussion symptoms. The purpose of this study is to integrate the use of the technology with the ability to push TBI treatment plans to end users' own

smartphone devices using mHIC's own mCare mobile app, and determine if positive clinical improvement can be seen in their symptoms.

mCare is an Military Health System approved mobile research program allowing direct connection between a Service Member's own smartphone and the Army's medical networks. First established in 2009, mCare and its supporting Mobile Health Care Environment have served as the foundation for over two dozen ground breaking mobile health studies. It became an official MEDCOM Program of Record in 2012, and began its first clinical trial in 2016.

LRMC DVBIC Senior Clinical Research Director, Kendra Jorgensen-Wagers Ph.D. felt the TATRC-LRMC partnership was the perfect combination. "We are thrilled to begin this exciting research project with TATRC. With their cutting-edge mobile research framework approved and already in place, they were the obvious choice to partner with on this important study."

The COTS tool selected, HitCheck, has quickly gained national recognition with interest from everyone from the aforementioned DVBIC, to the NFL, an organization also not unfamiliar with the issue of concussions and traumatic brain injury. Through a series of neurocognitive tests, HitCheck's mobile assessment helps users detect and monitor the signs of concussion in 7-10 minutes from any smartphone. HitCheck's personalized assessment will allow U.S. Military health care professionals to closely monitor patients' individual brain functions over time, helping them to track recovery and, ultimately, make more comprehensive care recommendations and return-to-activity decisions.

Work is expected to begin this Summer. ■■■

TATRC

4th Annual **OPEN HOUSE & TECHNOLOGY DEMONSTRATION**

Supporting Military Readiness through Innovative Technologies



When: Wednesday, 12 September 2018 • 10:00 am - 3:00 pm

Where: TATRC, Bldg. 1054, Patchel St. & TATRC Innovation Center (TIC)

What: An informal Open House to highlight & feature TATRC's ongoing research and managed programs. Guests will be able to see & experience our technologies and engage in open dialogue with the research leads.

Who: Thought Leaders & Collaborative Partners in Military Medicine

Why: To provide broad awareness of TATRC's core competency areas & current research portfolios & to highlight TATRC's unique capabilities firsthand.

RSVP: Advanced Registration is required NLT: Thursday, 16 August 2018, via e-mail to: anna.k.hagarman2.ctr@mail.mil or lori.a.debernardis.ctr@mail.mil

