COMBAT & CASUALTY CARE

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ADVANCING CARE THROUGH PANDEMIC LESSONS LEARNED

COMMANDER'S CORNER

BG Anthony McQueen
Commanding General
U.S. Army Medical Research and Development Command

COL Mark Stackle
Commander
U.S. Army Institute of Surgical Research
JBSA Fort Sam Houston

Dr. Timothy Nunez
Chief
Division of Trauma & Surgical Care
Brooke Army Medical Center

- Level 1 Trauma Care
- Extra-Corporeal Membrane Oxygenation
- National Emergency Tele-Critical Care Network
- Laparoscopic-based Surgical Robotics
- Global Mass Vaccine Supply
- Upper Limb Assistive Technology
- Traumatic Brain Injury

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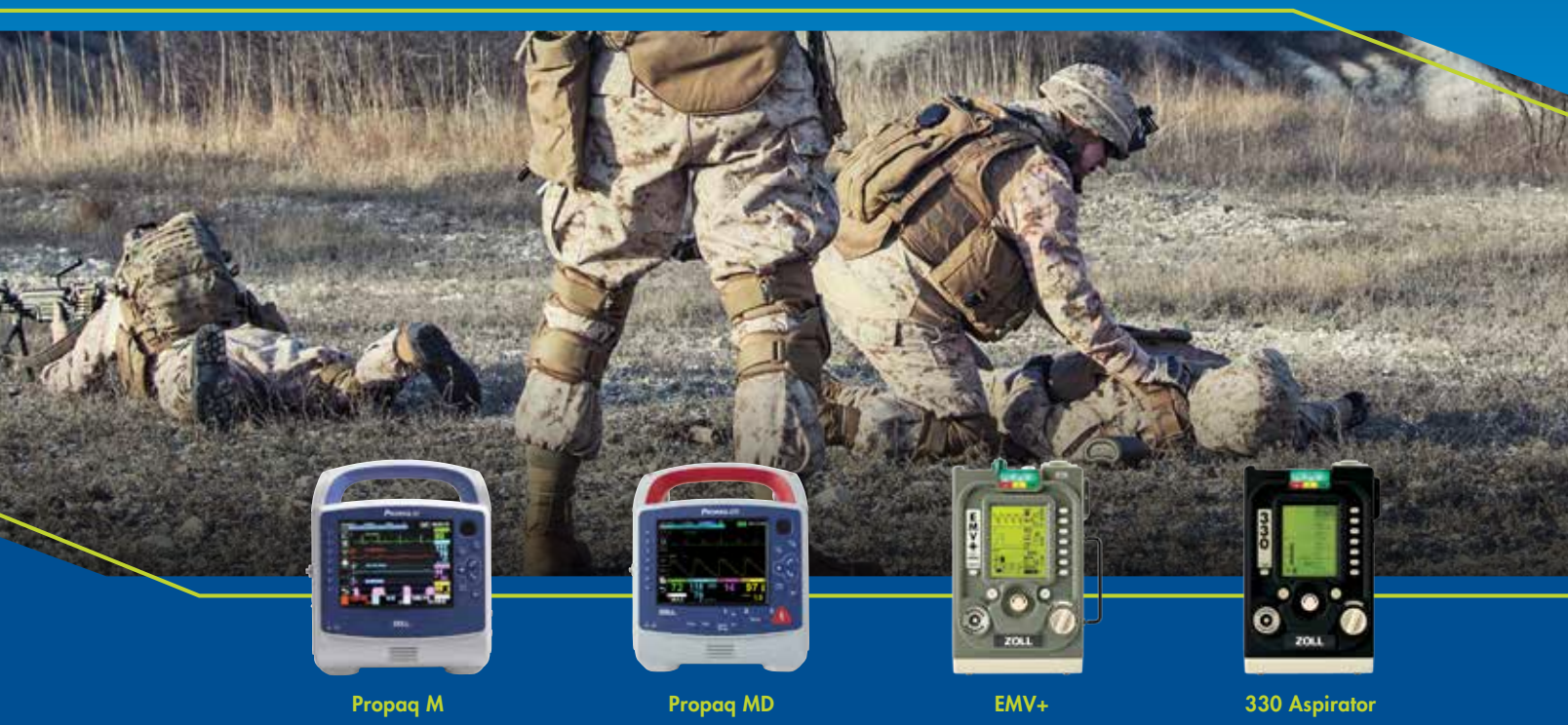

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COMMUNICATING, COLLABORATING, AND NAVIGATING THROUGH A 100-YEAR PANDEMIC

Brooke Army Medical Center, DoD's only Level 1 Trauma Care Center, was always ready for the contingency that only a 100-yr pandemic could represent.

By Col. Heather Yun and COL Jody Brown

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SURGICAL CARE FOCUS

PARNERING IN CRITICAL CARE

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Cover: Members of the Forward Surgical Team assigned to Forward Operating Base Wright perform surgery on a trauma patient at the installations medical center. The FST is a joint team made up of Active Duty and Reserve Army members, as well as Air Force augmentee's and provides front line trauma care.

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Mailing Address
Tactical Defense Media, Inc.
PO Box 1404
Olney, MD 20830 USA
Telephone: (301) 974-9792
Fax: (443) 637-3714
www.TacticalDefenseMedia.com
circulation@tacticaldefensemedia.com
editorial@tacticaldefensemedia.com
advertising@tacticaldefensemedia.com

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INSIGHTS

With 2021 in the rearview and a second full year of pandemic-driven challenges overcome, some of the most evident advances in healthcare owe their advent to a miniscule but deadly force of nature. From honed capabilities in level one trauma center respiratory support to enhanced technology in emergency telehealth, military medical treatment is raising the bar in COVID-19 lessons learned care delivery.

In the year-end issue of Combat & Casualty Care, readers get an insider's look at DoD's only Level 1 trauma care center at Brooke Army Medical Center (BAMC) as well as insight from high-level command at two of the U.S. Army's top medical and surgical care research entities. In an exclusive feature article from Col. Heather Yun, Deputy Commander for Medical Services, BAMC, and COL Jody Brown, Deputy Commander for Inpatient Services, BAMC, the implementation of extra-corporeal membrane oxygenation (ECMO) as a next-level treatment for patients in viral and other contagion-caused respiratory distress is changing outcomes for those otherwise deemed ventilator-dependent. On the surgical care front, Dr. Timothy Nunez, Chief of BAMC's Division of Trauma & Surgical Critical Care, discusses particular trends in balanced resuscitative care and evolving techniques in laparoscopic and robotic-based surgery.

With effective trauma care dependent on the research and development of relevant capabilities, C&CC had the fortune to hear from BG Anthony McQueen, Commanding General, U.S. Army Medical Research and Development Command (USAMRDC), Ft. Detrick, MD, regarding the latest in medical innovation, driven in good measure by the past couple years of pandemic-related necessity. From a surgical research perspective, Commander, U.S. Army Institute of Surgical Research (USAISR) COL Mark Stackle, speaks to some USAISR objectives relating to the optimization of combat casualty care targeting future Multi-Domain Operations (MDO) support.

Much of what drives healthcare is the prevention of future treatment need. This is certainly pertinent when dealing with the all too often combat-related traumatic brain injury (TBI). In a special to C&CC, LTC Stuart Hobbs, Product Manager, Warfighter Brain Health Program Management Office, U.S. Army Medical Material Development Activity (USAMMDA) and Mr. Louis Jasper, Project Manager, Warfighter Brain Health Program Management Office (WBH PMO), explore USAMMDA's efforts to develop and deliver brain health medical solutions, across the continuum of care, that aid in the prevention, detection, and treatment of TBI on the battlefield, at its inception.

Be sure not to miss this issue's spotlight on global mass vaccine delivery from Defense Logistics Agency Troop Support and Industry Perspective with Fort Defiance, Inc. on the latest in mobile water supply solutions. In the Industry Spotlight, Abilitech Medical speaks to their new software-driven upper limb assistive paralysis solution while rounding things off, Industry Partner North American Rescue (NAR) Simulation enlightens us on cutting edge realism in austere environment battlefield casualty care.

As always, we welcome any comments and thank you for your continued readership!

Christian Sheehy
Managing Editor
christian@tacticaldefensemedia.com

Sonia Bagherian
Publisher
soniab@tacticaldefensemedia.com

Jittima Saiwongnuan
Graphic Designer
jittima@tacticaldefensemedia.com

Ellie Collins
Circulation Manager
elliec@tacticaldefensemedia.com

COMMUNICATING, COLLABORATING AND NAVIGATING THROUGH A 100-YEAR PANDEMIC

Brooke Army Medical Center, DoD's only Level 1 Trauma Care Center, was always ready for the contingency that only a 100-yr pandemic could represent.

By Col. Heather Yun and COL Jody Brown

Army Spc. David Pyke, medical laboratory technician, loads a patient sample for rapid COVID-19 polymerase chain reaction testing at Brooke Army Medical Center, Fort Sam Houston, TX. (U.S. Army photo by Jason W. Edwards)

How do you prepare for a health crisis that comes around once every century?

Military combat units are well-known for planning and training for myriad contingencies, and the healthcare system is challenged to stay one step ahead in order to keep every service member in the fight. If the readiness level of doctors, nurses, combat medics, etc., is not at its peak, the ultimate sacrifice becomes an unwelcome result. And make no mistake; this 100-year pandemic is a war threatening not only our way of life, but the readiness of the force.

Brook Army Medical Center is the only Level I Trauma Center in the Department of Defense. It has been called the flagship of the military health system in the Defense Health Agency. BAMC's strength is as a research and training organization. As part of "Military City USA," better known as San Antonio, Texas, BAMC partners with the Southwest Regional Advisory Council (STRAC), executing regional trauma and emergency healthcare. Alongside University Health System (the only other Level I Trauma Center in the region), BAMC provides lifesaving care to more than 4,000 trauma patients each year, including 750 burn patients, from an area that stretches across 22 counties in Southwest Texas and encompasses 2.2 million people.

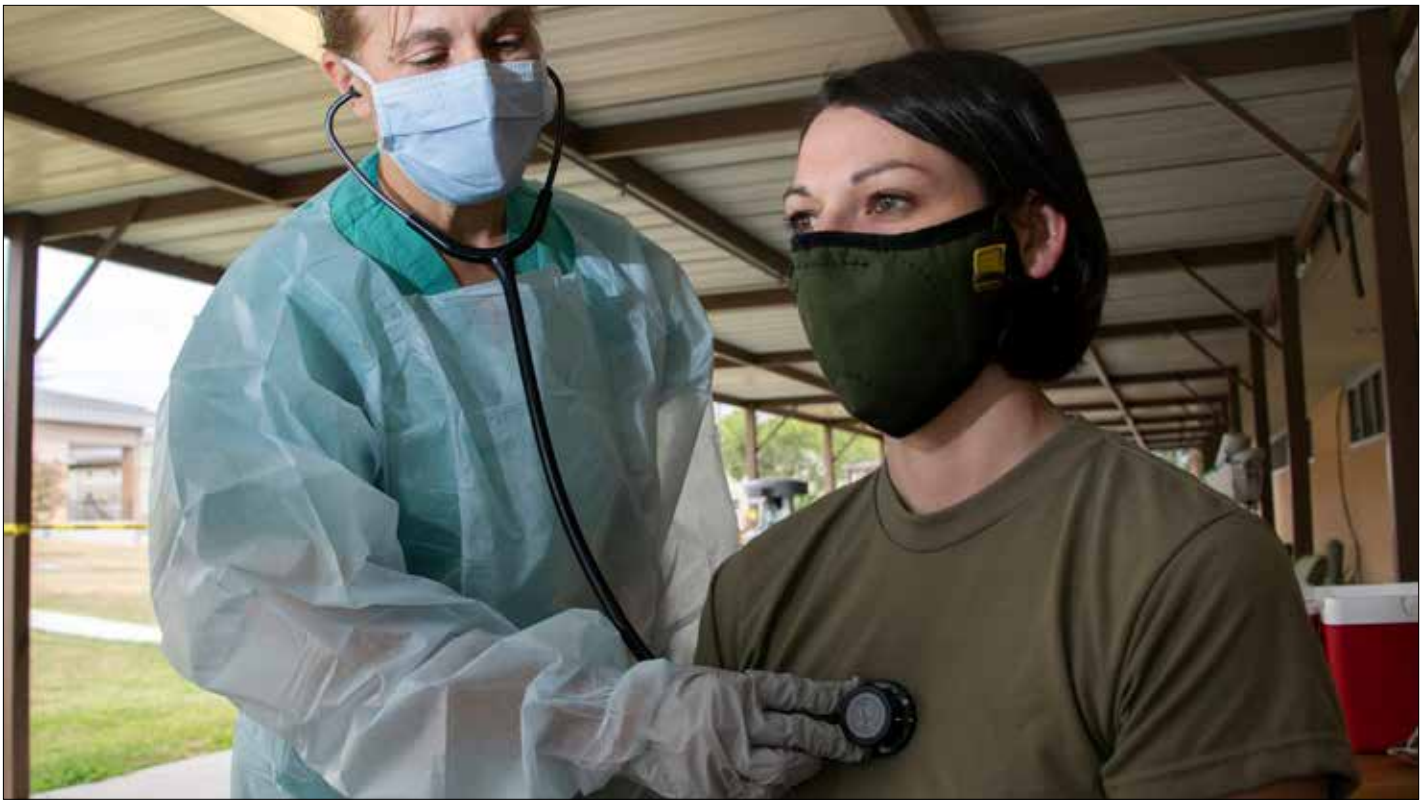
Oddly enough, the last city-wide exercise led by STRAC was a scenario based on…a pandemic.

Did that have BAMC and the rest of the city prepared for COVID-19? Not exactly, but the advantage of great communication and collaboration with local hospitals helped all of us navigate the numerous changes seen during this once-in-a-lifetime event.

COMBATING COVID-19

The battle against COVID-19 has taken a concerted, multidisciplinary effort. BAMC relied upon the expertise of infectious disease, critical care, hospital medicine and primary care experts to develop guidance locally every step of the way that then could be disseminated to the rest of the DHA. The virus forced everyone to look at some of our processes and understand how we could do things better in the future, more effectively and cross-leverage resources across the organization.

What the staff learned is a greater appreciation for the role each individual plays in the care of patients and each other. BAMC had to be incredibly agile to stay ahead of the evolving situation, and being able to move on a dime within hours of new guidance. Keeping up with the



U.S. Army Col. April Critelli, physician's assistant, screens a patient for COVID-19 at the McWethy Troop Medical Clinic, Fort Sam Houston, Texas. Critelli is the first medical Soldier to return to active duty from retirement during the COVID-19 crisis. (U.S. Army photo by Jason W. Edwards)

demand for testing was a challenge.

There were a number of efforts BAMC instituted to maintain a safe and secure environment, while continuing to deliver world-class health care, and assist the community effort against COVID-19. BAMC increased trauma patient throughput, utilized extracorporeal membrane oxygenation (ECMO) for the most severe COVID-19 cases, made changes in pharmacy operations, expanded virtual health, deployed critical staff members to hotspots, isolated testing, and developed a well-thought-out vaccination plan. These are a few areas BAMC helped mitigate the effects of COVID-19.

ADAPTING TO SUPPORT THE COMMUNITY

With local hospitals nearing capacity, BAMC took on additional trauma patients through STRAC to ensure the region's trauma response remained unaffected by the pandemic. About 85 percent of BAMC's trauma admissions are community members without military affiliation. BAMC is able to accept civilian trauma patients for care through the DoD's Secretarial Designee Program and related special authorities.

BAMC increased its ability to care for the area's most critically ill COVID-19 patients, to include beneficiaries, veterans and civilian patients, through the expanded use ECMO treatment. These efforts helped ease the burden on local healthcare resources and saved lives.

ECMO is a heart-lung bypass system used in the intensive care unit when a patient has heart and/or lung failure. The ECMO machine removes blood from large central vessels in a patient's body, circulates it through an external artificial lung, oxygenates it, and delivers the blood back into the bloodstream. It essentially does the work of an injured lung and is the last line of defense against respiratory failure caused by the COVID-19 virus.

Patients with severe lung injury can have mortality rates of greater than 50 percent. ECMO has been shown to reduce this mortality down to approximately 30 to 40 percent. Functionally bypassing the lungs with an ECMO machine can provide precious time for patients to receive anti-viral treatments and heal from COVID-19 infection.

ECMO is often the last line of defense for the most critically ill patients with severe pulmonary disease. Whether due to COVID-19 or another condition, ECMO provided a life-support option that could save lives when all other options were exhausted.

With the program in place for nearly a decade, BAMC's COVID team is accustomed to working closely with local hospitals in the event a patient may be a candidate for ECMO. This collaboration has proven vital in relieving the stress on local hospitals, particularly during COVID surges.

BAMC, provides up to one-third of the ECMO capability for the San Antonio area's most severely ill community members, veterans and military beneficiaries suffering from the virus. Each life saved is incredibly rewarding and a testament to the importance of this treatment.

CURBSIDE PHARMACY

To help stop the spread of the COVID-19 virus, the San Antonio Military Market implemented curbside drop-off and pick-up pharmacy services at many of its locations. The BAMC Pharmacy team quickly came together on very short notice and successfully implemented a new curbside pharmacy service in less than 48 hours.

Over the course of just two months, BAMC serviced over 89,500 vehicles and dispensed over 162,000 prescriptions. At the peak of operations in June 2020, BAMC processed over 97,500 prescriptions through its drop-off and pick-up in-house services.

VIRTUAL HEALTHCARE

Three years ago, BAMC became an innovation focal point with the launch of the military's first Virtual Medical Center. The center's intent is to serve as a testbed for new capabilities and a centralized program structure to advise and oversee global virtual health efforts.

Since that time, virtual health has proven invaluable in supporting troops on the battlefield with real-time health assessments. BAMC providers and specialists also serve in a virtual advisory capacity to their counterparts downrange. Additionally, the center's Mobile Medic program educates medics around the world, enabling them to conduct medical assessments in the field while communicating with a health care provider via video conferencing.

In response to the COVID-19 pandemic, BAMC and the V-MEDCEN increased virtual health appointments from 16 percent of overall appointments in January 2020 to 52 percent in May 2020

BAMC also enrolled patients in the new COVID-19 Remote Monitoring Program, a joint effort of the V-MEDCEN. The program equips COVID-19 patients needing additional monitoring with a home healthcare kit and 24/7 over sight from registered nurses to ensure a higher level of post-hospital care.

In effect, the program "bridges the continuum of care" from inpatient to outpatient. The idea for the program was spurred by lessons learned in New York.

BAMC PERSONNEL DEPLOY DOMESTICALLY AND GLOBALLY

Army personnel assigned to BAMC have supported over 40 national and international COVID response efforts with greater than 225 MTOE Assigned Personnel and MEDCOM Soldiers from March 2020 thru November 2021, to include Arkansas, California, Colorado, Florida, Idaho, Kentucky, Mississippi, New Jersey, New York, Ohio, Tennessee, Texas, Washington, Wisconsin, Guam, US Virgin Islands and Iraq.

Support includes Urban Augmentation Medical Task Force (UAMTF) Teams, Medical Care Augmentation Teams (MCAT), Medical Readiness Teams (MRT), and COVID Vaccination Support Teams.

Nearly 40 healthcare professionals from BAMC deployed to New York City from March 27 to May 11, 2020 in support of the Department of Defense COVID-19 response. They joined a team of 800 Army and Navy medical personnel to help transform the Jacob K. Javits Center, a massive convention center in Manhattan, into a medical shelter to treat non-COVID patients.

Seventeen BAMC military healthcare personnel assigned to the 627th Hospital Center deployed to Seattle for about three weeks to set up a 148-bed hospital within the convention center attached to CenturyLink Stadium.

An Infectious Disease physician from BAMC also deployed to Guam in support of the USS Theodore Roosevelt COVID-19 response.

Other BAMC personnel assigned to the 115th Field Hospital supported U.S. Central Command in the fight against COVID-19.

RESEARCH AND STUDIES

BAMC explored every opportunity to participate in local, national and global studies and research efforts in a concerted effort to save lives and ensure the health and welfare of the force.

BAMC has the second largest research portfolio in the Defense Department. Alongside military and civilian organizations, BAMC joined the nation's first clinical trial to evaluate an experimental treatment for the virus. The Adaptive COVID-19 Treatment Trial, or ACTT, centered on an antiviral drug called remdesivir, formerly touted as a potential Ebola treatment.

The National Institute of Allergy and Infectious Diseases sponsored study enrolled over a thousand people across the nation as it looked to determine if the antiviral drug was effective against COVID-19.

NIAID released promising preliminary results indicating that hospitalized patients with advanced COVID-19 and lung involvement who received remdesivir recovered faster than similar patients who received a placebo, according to a NIAID press release.

Based on preliminary research on the drug, BAMC joined an Army-sponsored force health protection clinical protocol that will enable providers to use remdesivir on a case-by-case, emergency

basis to treat military personnel and protect deployed or remote service members as needed.

BAMC and Wilford Hall Ambulatory Surgical Center, Lackland Air Force Base, Texas were two of five Department of Defense locations taking part in the Phase III trial to evaluate the vaccine under development by AstraZeneca. The AstraZeneca vaccine trial was one of many national trials being conducted through then Operation Warp Speed, and the first to encompass the DoD.

We are in a war against the virus, and medical research is the intelligence operation that enables us to stay agile and one step ahead of the enemy. These are the studies that drive innovation, change practice, and ensure that we have all the tools available to provide the best care for our patients, now and in the future.

UNSUNG HEROES

COVID and the expanded ECMO mission transformed units and intermingled staff from other areas to take aim at an obvious priority – manning beds to provide proper care during periods of greatly increased demand. Nurses were shifted from various areas of the hospital to the newly formed COVID wards and ICUs; equipment-laden areas devoid of the chatter of family and friends.

The manpower was a limited pool, particularly as deployments, humanitarian missions and community-based support requirements drew military personnel away, many deployed overseas and stateside.

Hours were long, and emotionally stressful as staff worked, trained, cared for their patients, day in and day out. During all of this, nurses were understandably nervous about contracting the virus – another added stressor.

Aside from the staff, a BAMC-supplied tablet was often a patient's only link to the outside world and loved ones. Nurses did their best to fill the void with technology, an avenue that has proved vital for patient communication and morale.

COVID testing became the main focus in the laboratory. Lab technicians often run testing for 24 hours, when the number of samples collected necessitates around-the-clock operations. BAMC benefited from support provided by separate commands located on Fort Sam Houston (Public Health Laboratory) and retired Army officers who were reactivated to support the COVID-19 response."

The laboratory has shown amazing resilience as it has adapted to the evolutionary changes that have come from the (Centers for Disease Control, and Prevention, the Defense Department and other agencies regarding the understanding of COVID-19.

BAMC also provided community support through its drive-thru screening and testing operation. Operational since the earliest days of the COVID response, BAMC eased the burden on the city's overtaxed testing sites.

Providing on-site testing for military beneficiaries, BAMC helped eliminated the need for them to seek alternative testing locations furnished by state and local health officials. Testing conveniently located on campus produces results within 24 hours.

Drive-thru screening and testing kept thousands of potentially infected patients out of the hospital, minimizing the spread of the virus to other healthcare workers and enabling the BAMC team to continue to see other patients.

The keys to success have been in communication, deference to expertise, and collaboration. Constant communication across the organization ensures that concerns are addressed as early and effectively as possible, before they become safety issues. Relying on subject matter experts to keep up with the science and advances in their field provided counsel and refinement of our responses.

COVID-19 VACCINE ARRIVES AT BAMC

When the Food and Drug Administration is sued an emergency use authorization, or EUA, for the Pfizer BioNTech COVID vaccine on Dec. 11, 2020, BAMC healthcare professionals volunteered to be among the first to receive the shot.

The mentality at BAMC has been one that for every person who steps up to take the vaccine when it's their turn is another step toward ending the pandemic.

The vaccine was the turning point that many healthcare professionals were waiting for, and was viewed as a necessary step to putting the pandemic in the past.

LOOKING FORWARD

While the war against this unseen enemy continues, BAMC maintains its priority of excellence in healthcare. The American College of Surgeons National Surgical Quality Improvement Program recently recognized BAMC for achieving meritorious outcomes for surgical patient care for three years running, ranking the hospital among the top 10 percent of participating hospitals for surgical care.

Achieving meritorious recognition means that BAMC ranks in the top 10 percent of over 706 hospitals on this composite surgical quality score.

In early October 2021, a Joint Commission (TJC) survey team assessed BAMC for recertification. TJC is a global driver of quality improvement and patient safety in health care. Their collection of leading practices, knowledge and expertise and rigorous standards help lead healthcare organizations to zero harm.

TJC evaluates and accredits more than 21,000 healthcare organizations and programs in the United States and is the nation's oldest and largest standards-setting and accrediting body in healthcare. To earn and maintain TJC's Gold Seal of Approval™, an organization must undergo an on-site survey by a Joint Commission survey team at least every three years.

The surveyors frequently noted evidence of demonstrated commitment to becoming a highly reliable organization, emphasizing numerous examples of performance improvement initiatives designed to enhance the quality of care.

To say BAMC has been busy over the past 24 months is a gross understatement. But, the entire workforce remains laser-focused on providing the world-class healthcare its beneficiaries earned and deserve.

Someday, grandchildren of BAMC staff will ask what it was like during the COVID-19 pandemic. We will tell them about how we all worked together so hard and took care of each other.

DELIVERING MISSION-CRITICAL WATER SYSTEMS

Leading supplier of customized field hospital water systems is offering a potable and wastewater distribution solution for use in any mobile, combat environment.

By John Hodges, Vice President, Fort Defiance Industries

For more than fifteen years, Fort Defiance Industries (FDI) has provided American-made water system components to the U.S. military and has now become the preferred vendor for newly designed Army field hospitals. FDI is also working with the Navy on water systems for new naval field hospitals.

MILITARY-GRADE QUALITY

FDI water systems are built to U.S. military standards and are NSF-61 compliant. Each system is a group of assemblies whose components form a pressurized potable water distribution and wastewater management system for field use. They deliver potable water to all types of hospital wards including intensive care, intermediate care, pre-op, central materiel supply, pharmacy, x-ray, blood laboratory, laboratory, emergency medical treatment, and dental clinics. In addition, the systems allow for distribution and collection of waste water from these same areas.

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Each water system includes pumps, chlorination, storage tanks, and cold weather protection, with optional lay-flat discharge hoses offering a significant logistical advantage with low cube and weight. The end-user is supplied with quick disconnect fittings for rapid assembly and disassembly. Parts are identified with laser-etched part numbers and NSNs, making system design and ordering simple. Each water system is kitted to the customer's specifications and delivered in their preferred containers to ease the logistical burden.

MULTI-MISSION READY

FDI's field water systems are tested and field-proven to ensure consistent performance in various austere environments, and can be customized to serve a wide range of applications. Whether an armed forces endeavor or humanitarian aid effort, FDI's water systems are designed to efficiently manage potable water and wastewater throughout the operational lifecycle.

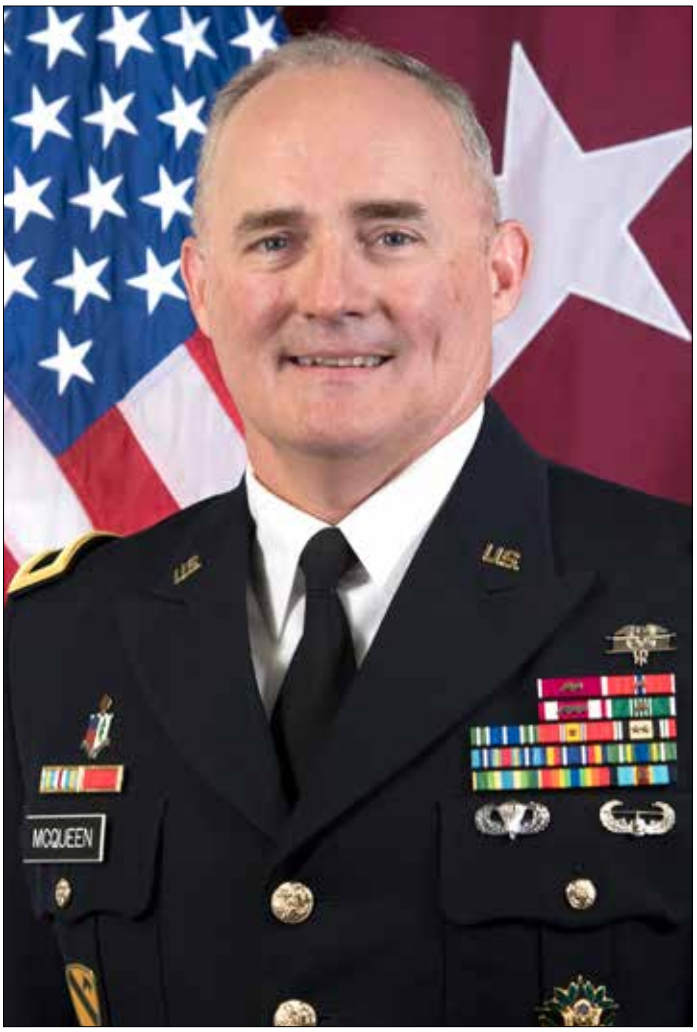
More info: *fortdefianceind.com*

INNOVATION DESIGNED TO UNMASK THE UNKNOWN

Brigadier General McQueen is a native of Texas and a graduate of Sam Houston State University where he was commissioned as an ROTC Distinguished Military Graduate in 1991. Brigadier General McQueen most recently served as the Deputy Chief of Staff, G-3/5/7 United States Army Medical Command and was detailed to Operation Warp Speed from May 2020 - May 2021. He has commanded at every level from company through brigade. He most recently commanded Blanchfield Army Community Hospital, United States Army Medical Activity, Fort Campbell, Kentucky from June 2017 to June 2019 and the 402d Army Field Support Brigade, Fort Shafter, Hawaii from August 2015 to June 2017.

He served two Operation Iraqi Freedom combat tours and two tours in the Republic of Korea. He has served with the 2nd Infantry Division, the 25th Infantry Division, 4th Infantry Division, and the 1st Cavalry Division. He has also held key leadership positions at both the Medical Brigade and Brigade Combat Team levels, Division Staff, U.S. Army Medical Center of Excellence, and the Office of the Surgeon General.

Brigadier General McQueen is a graduate of the Army Medical Department Officer Basic Course; he has also completed the Combined Logistics Officer Advanced Course, the Command and General Staff College at Fort Leavenworth, Kansas and the National War College. He holds a Master of Science in National Security Strategy, and a Master of Arts in Health Services Management.



BG Anthony McQueen

Commanding General
U.S. Army Medical Research and Development Command

Combat & Casualty Care had the opportunity to speak with BG Anthony McQueen, Commanding General, U.S. Army Medical Research and Development Command (USAMRDC) and Ft. Detrick, Maryland, regarding USAMRDC efforts to support and sustain the health of current and future Army personnel using lessons learned during the recent global pandemic.

C&CC: USAMRDC has received a substantial amount of national attention over the past 18 months, specifically focusing on your sprawling response to the COVID-19 pandemic. Is the command still involved in the response effort, and what are of some of your current efforts to detect, prevent, and treat COVID-19?

BG McQueen: Yes, USAMRDC is still actively involved in the federal government's efforts to fight COVID-19, as is the Department of Defense as a whole. During the past year-and-a-half, this has been a major focus of ours. From the earliest efforts in developing virus countermeasures to our work with both convalescent plasma and monoclonal antibodies, we have been developing solutions in concert with the whole of government response while encouraging innovation and collaboration among our own scientists and partners.

One of the efforts I'm most excited about is a new method for improving surveillance capacity for emerging infections and biothreat agents called Biodefense Mass Sequencing and Surveillance – or B-MASS for short – which we developed for COVID-19. B-MASS allows large formation testing with both a rapid turnaround time and individual sample results; using next generation sequencing, any positive samples can be immediately identified by the barcode from among a large group of pooled samples. Overall, this approach enables commanders to limit spread by quickly isolating potentially positive cases.

With B-MASS, we can screen thousands of samples at one time, and see the results for each individual sample within 24 to 48 hours. This could be especially useful for surveillance testing of Army personnel during basic training, Navy personnel on aircraft carriers and other large populations. In fact, several months ago at the Naval Academy, there was a single, specific week where administrators experienced triple-digit caseloads. We were surveilling their asymptomatic population at that time, and we were able to identify eight asymptomatic and one pre-symptomatic case in their population for referral for medical care and clinical testing.

One of the greatest benefits of B-MASS is that it uses standard materials that are readily available, and it runs on instruments that are

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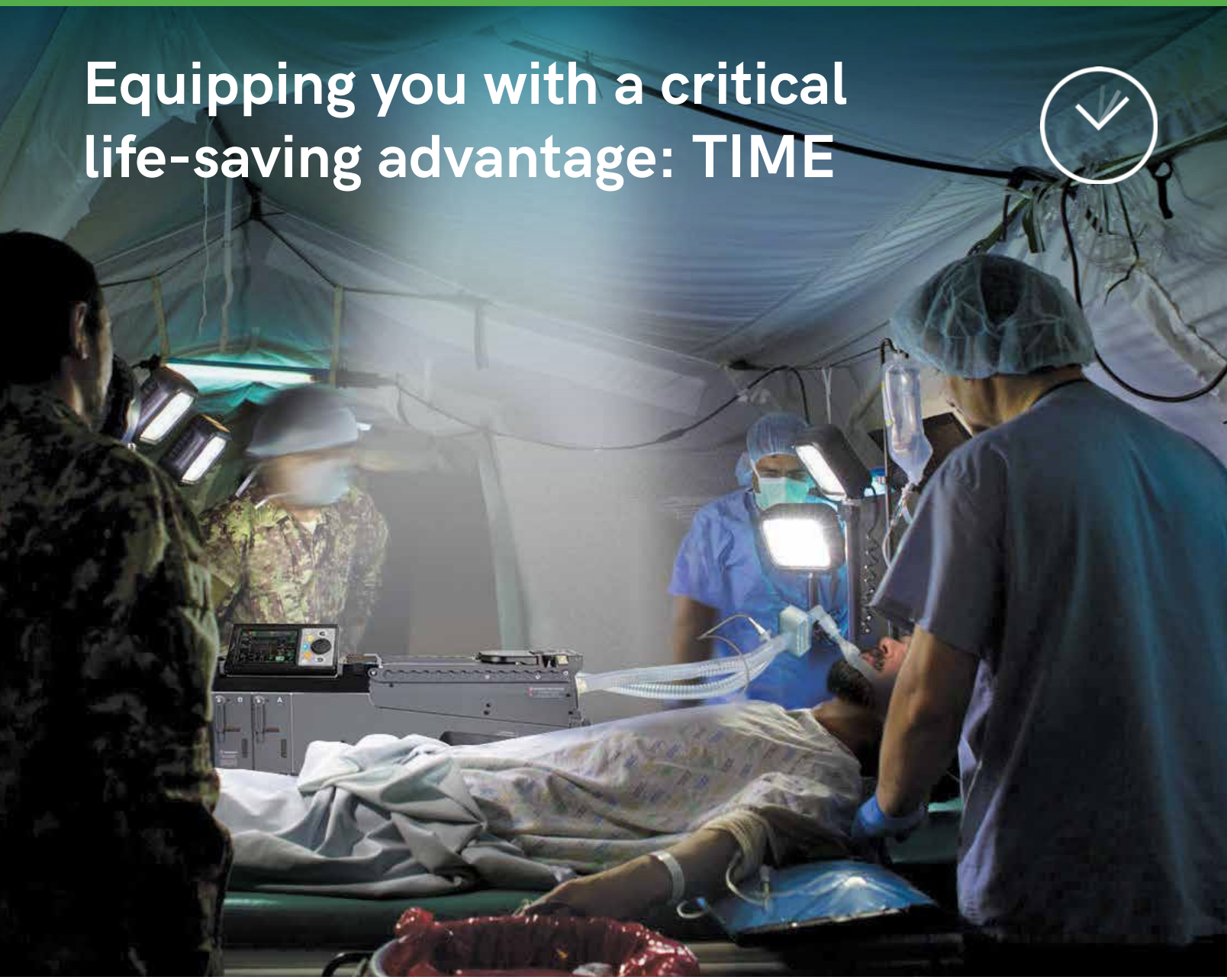

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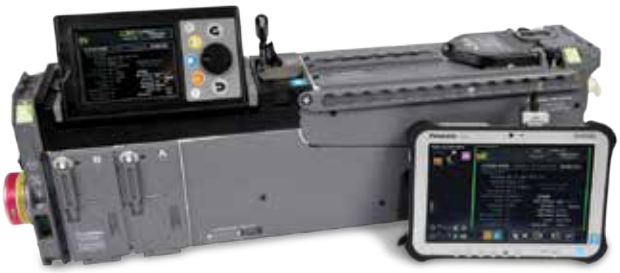

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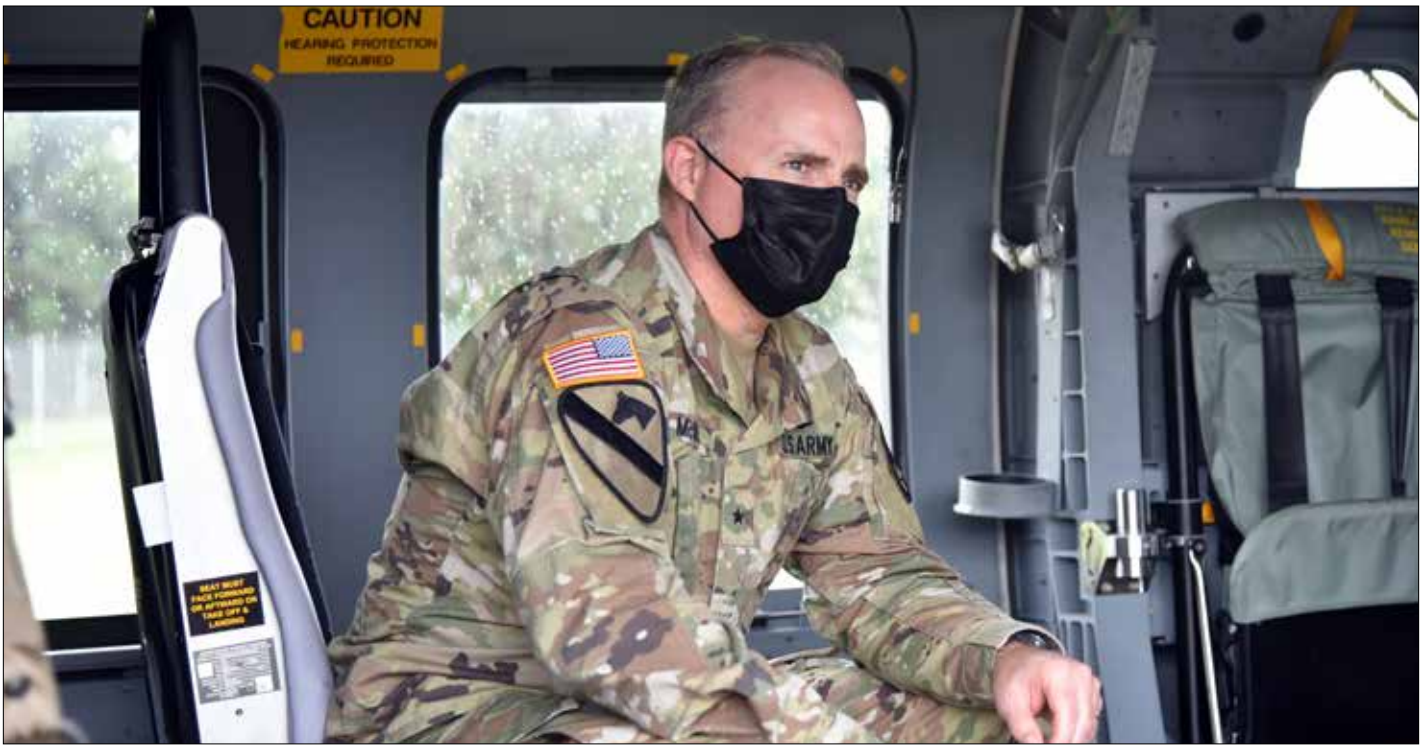


BG McQueen tours a medical transport vehicle during the Army Tactical Telemedicine Performance and Operational Impacts Workshop at the Air Force Medical Readiness Agency grounds at Fort Detrick. MD. (Gloriann Martin, USAMRDC Public Affairs)

already present in DOD research and public health laboratories. More importantly, B-MASS could allow us to look for multiple diseases at the same time, meaning its potential extends far beyond the current pandemic. We've already developed a test that screens for two types of influenza, along with COVID-19. Using this approach, we can help the DOD respond rapidly and economically to future emerging diseases.

C&CC: In the past few months, the concept of "wearable health devices" has received substantial global attention. Here again, USAMRDC appears to be on the forefront of innovation – correct?

BG McQueen: This is a great example of USAMRDC setting the pace of innovation. The attention placed on wearable devices comes from the desire for better detection of potential infection; so this is a place where we can see our positive impact on both the Warfighter and the larger American public. To that end, our scientists have been working on a variety of wearable technologies that use computer algorithms to predict COVID-19 infections before individuals feel sick.

One effort we're working on is with both the University of California, San Francisco, and the University of California, San Diego, to develop an algorithm designed to detect the virus before a person might even begin to notice symptoms. By combining that algorithm with a so-called "smart ring" – as in, a literal piece of jewelry you'd wear on your finger – scientists could in turn generate continuous temperature data on any subject. In a study released earlier this year, the team developing the technology found the ring accurately identified higher temperatures in people with symptoms of COVID-19. Fine tuning of the algorithms could potentially lead to early identification of COVID-19 infection.

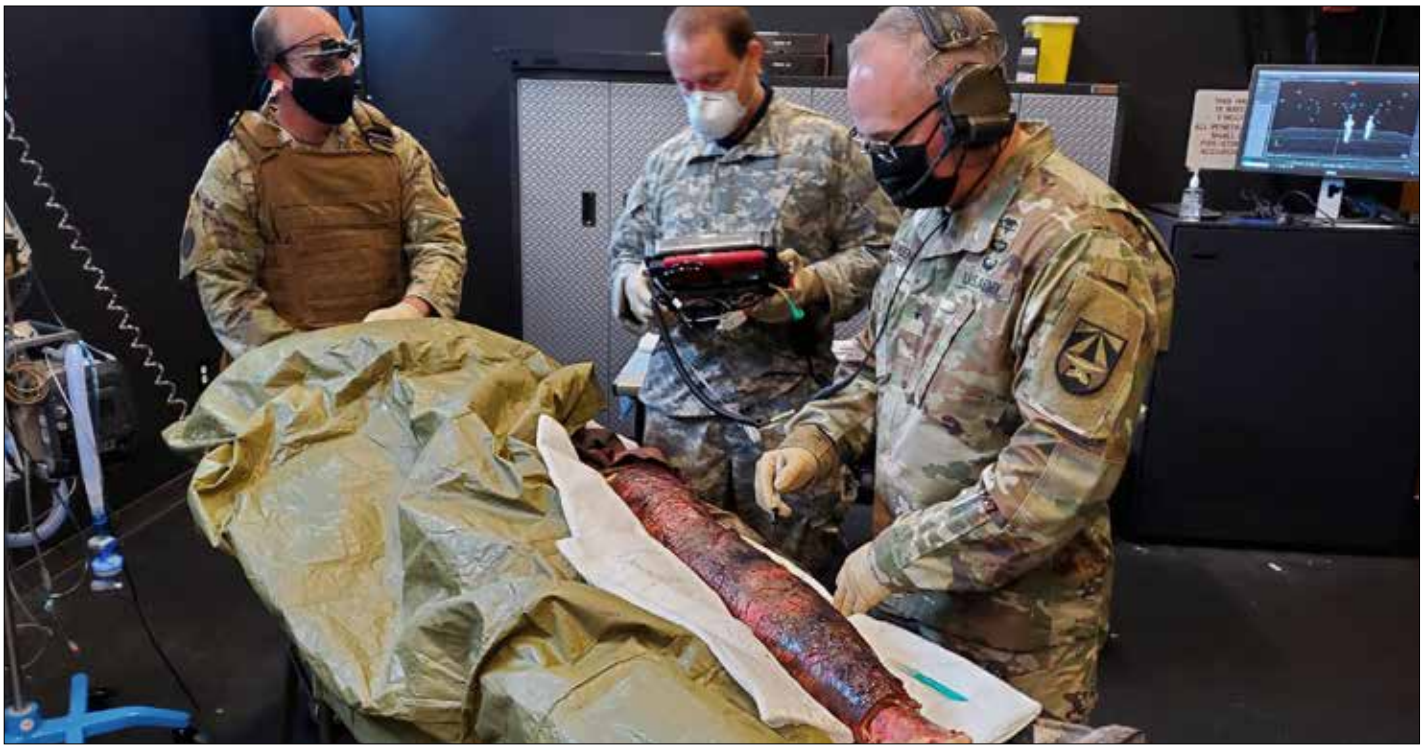
Similarly, we'll soon be starting a trial that will combine an infection detection algorithm with a small, wearable, waterproof sensor that is worn like a BAND-AID across the chest. This platform is currently being developed to monitor core body temperature and heat strain risk. It's likely the sensor will also be able to measure blood oxygen levels – an important metric for the current pandemic as low blood oxygen can be a symptom of COVID-19. Sensors like these are ideal for the military as they can be worn comfortably around the clock for more than 72 hours – and potentially up to one full week – without the need for recharging. In addition, it can continuously monitor Soldiers while in garrison, throughout training and during operations. The pilot program is currently being designed and discussions are underway regarding testing this specific platform in an enclosed space like a Navy Ship or Aircraft carrier.

In a future pandemic scenario, these types of wearable technology will likely be crucial for both its ability to monitor the health of our troops across every minute of every day, and maintaining readiness by identifying individuals for earlier testing and isolation if needed — ultimately slowing or stopping the spread of infectious diseases in our formations.

C&CC: Can you provide us with the latest information on USAMRDC's efforts to develop a new COVID-19 vaccine platform?

BG McQueen: The vaccine is being developed by the team at USAMRDC's Walter Reed Army Institute of Medicine, and is currently in Phase 1 clinical trials. To date the results have been very promising.

The platform itself is called "SpFN", which is short for "spike ferritin nanoparticle". It is unique because it has the potential to combat all coronaviruses – not just COVID-19. The broad coverage of coronaviruses is where the real value of this platform comes into play, and a feature that makes it unique in the current marketplace. The SpFN vaccine employs ferritin, a protein found in almost all living organisms, and the spike proteins from coronaviruses. The ferritin molecules are linked together into a virus-like nanoparticle, and the spike proteins are embedded in the sphere; this structure approximates the size and shape of a natural virus to trigger a robust protective response from our immune system.



BG McQueen tours the newly-installed NEXUS lab at the USAMRDC's Telemedicine and Advanced Technology Research Center. The lab operates as a high-tech medical performance measurement facility that studies the capacity and acuity of military medical professionals as they perform various medical tasks. (USAMRDC Public Affairs)

Another positive when dealing with protein-based vaccines like SpFN is that they are very stable. Our SpFN vaccine can be kept in the fridge for up to six months, and kept at room temperature for up to one month. This is a real value when you talk about potentially delivering this vaccine across large tracts of land or in faraway, austere environments; it has the potential to be a real benefit for our Service Members in a multi-domain operation scenario. We're expecting more complete data on this vaccine to be released publicly very soon.

C&CC: How important is it for USAMRDC to stay in the middle of the COVID-19 fight? How does the command both influence and complement the other parts of the DoD when it comes to acquisition and, ultimately, keeping Soldiers ready and resilient?

BG McQueen: It's extremely important to stay engaged in this effort because we must be prepared for the next potential threat. An example of a relatively new technology that can help us do that is the National Emergency Tele-critical Care Network (NETCCN), which was developed by USAMRDC's Telemedicine and Advanced Technology Research Center. NETCCN creates "virtual critical care wards" that can bring high-quality care capability – via current handheld mobile devices – to nearly every bedside in the country and has the potential for impact in both the military and civilian worlds. What sets NETCCN apart from standard telehealth care is that it operates from point-to-point – or, from "anywhere to anywhere" – as opposed to the traditional "hub and spoke" model, which is dependent on a single outlet broadcasting instruction to a series of single users. This enables NETCCN to rapidly scale for surges in demand. In addition NETCCN is suitable for military and civilian austere environments as it is a cloud-based, low-resource, stand-alone health information management system. A tool like this could truly revolutionize care during large-scale disasters, or in other emergency situations where there are simply not enough qualified clinicians on-site to provide care; think earthquakes or other natural disasters. Further, NETCCN could allow a medic to aid in life or death, complicated care issues that might normally be beyond the scope of their expertise given that they would have access to and support from literally any echelon of care.

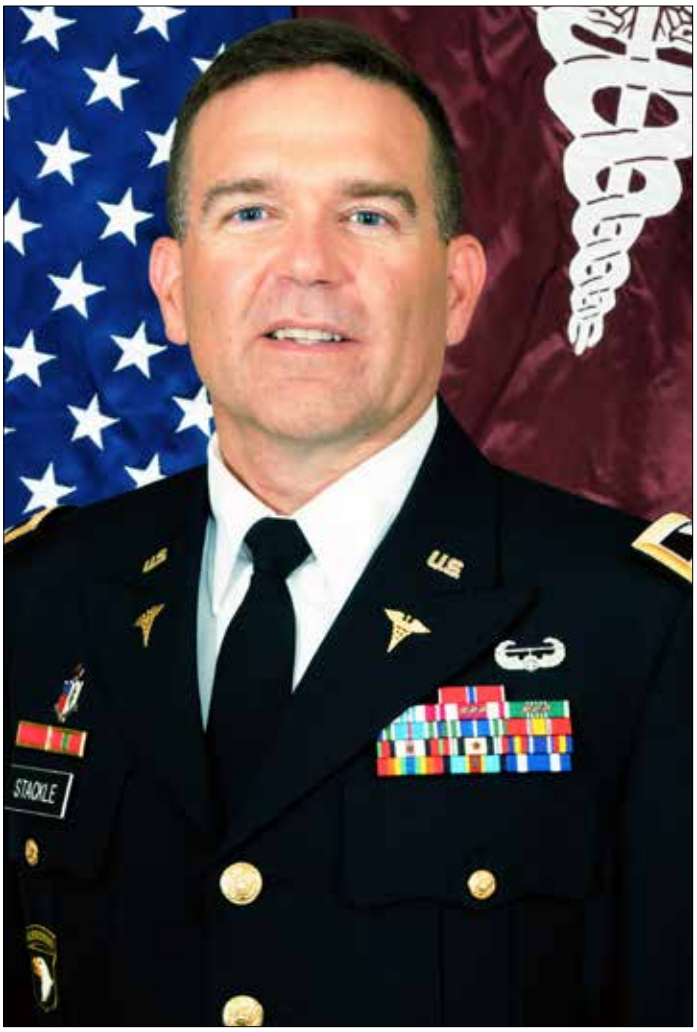
The development of NETCCN is a great example of the power of partnerships and collaboration – key elements in everything we do at USAMRDC. For NETCCN specifically, we relied heavily on our partnership with the Medical Technology Enterprise Consortium, a nonprofit designed to accelerate the translation of medical technologies into solutions focusing chiefly on the health of U.S. military personnel and veterans. Partnering with MTEC allowed us operate a solicitation process in a more transparent and collaborative manner, breaking down traditional acquisition barriers that tend to restrict government-industry interactions.

A notable success story for NETCCN occurred during its first month after launch, when a bedside nurse in Guam used NETCCN to call for assistance with an unstable COVID-19 patient. That nurse reached a physician from Brooke Army Medical Center and a nurse from Naval Medical Center San Diego for an evaluation, with the U.S.-based team quickly diagnosing the issue and walking the on-site nurse through a procedure which eventually stabilized the patient.

C&CC: Do you have any additional goals planned for USAMRDC moving forward?

BG McQueen: We always want to do more – to maximize the capabilities we can deliver to the Warfighter. We're always trying to build upon the talent and expertise we have, and – in turn – we're always trying to ensure we use our wide partnership base to bring new and promising ideas or technologies into sharper focus. It's a challenge– but it's also a great opportunity to demonstrate on a consistent basis who we are, why we play such an important role within the DOD and how we can have a substantial impact in the overall care of the Warfighter and Nation.

OPTIMIZING CARE FORWARD PANDEMIC AND BEYOND



COL Mark Stackle

Commander
U.S. Army Institute of Surgical Research

Colonel Stackle began his Army career after graduating in 1997 from Gonzaga University where he also served as the student body president. He received his Doctor of Medicine degree in 2001 from Georgetown University School of Medicine and went on to complete his Family Medicine residency at Tripler Army Medical Center, Hawaii, where he served as Chief Resident.

After completion of his residency training, Colonel Stackle commanded the United States Army Health Clinic Babenhausen, Germany, from 2004 to 2006, and served as the Medical Director for the Army Medical Department's Armed Force Health Longitudinal Technology Application (AHLTA) Program Office in Washington, D.C., from 2006 to 2009, part of which he served with the 526th Brigade Support Battalion, 2nd Brigade Combat Team, 101st Airborne Division, during Operation Iraqi Freedom. In 2011, Colonel Stackle completed the Madigan Faculty Development Fellowship during which he earned his Masters in Business Administration from Pacific Lutheran University. After completion of his fellowship, he served as a faculty physician with the Eisenhower Army Medical Center Family Medicine Residency Program at Fort Gordon, Georgia, before serving as Family Medicine Residency Program Director at Womack Army Medical Center at Fort Bragg, North Carolina from 2012 to 2015. Subsequently, he was assigned as the Deputy Commander for Clinical Services at US Army Medical Activity Japan from 2015 to 2017. From 2017 to 2019, Colonel Stackle served as the Command Surgeon for the 4th Infantry Division at Fort Carson, Colorado and deployed as the United States Forces Afghanistan Command Surgeon in support of Operation Freedom's Sentinel and Resolute Support. Colonel Stackle's most recent assignment was a one-year assignment at the United States Army War College in Carlisle Barracks, Pennsylvania where he earned his Masters in Strategic Studies degree in 2020.

Combat & Casualty Care spoke with COL Mark Stackle, Commander, USAISR, regarding the organization's current challenges in continuing the pandemic fight while ensuring the surgical capabilities research mission forges ahead.

C&CC: Speak to your primary role within USAISR and your primary mission.

COL Stackle: I currently serve as the Commander of the U.S. Army Institute of Surgical Research (USAISR) under the U.S. Army Medical Research and Development Command (USAMRDC). USAMRDC is a component command of the U.S. Army Futures Command (AFC) – the Army's lead modernization organization. As the Army's premier medical research organization focused exclusively on the combat wounded and home of the only Burn Center in the Department of Defense, our primary mission is to "Optimize Combat Casualty Care." The medical research activities performed at the USAISR are focused on saving lives on the battlefields of today as well as preparing for future combat scenarios involving Large Scale Combat Operations in a Multi-Domain Operating environment.

C&CC: How has the COVID-19 pandemic affected your staff and their ability to accomplish its assigned missions?

COL Stackle: Our staff at the USAISR are the organization's most precious and valued asset. Our foremost priority over the past twenty months of the pandemic has been maintaining the safety and wellbeing of these cherished teammates. It is because of the talented men and women within the USAISR that our institute has helped achieve the lowest combat casualty rates in modern warfare over the past two decades. Our dedicated team members helped accomplish this by developing materiel and knowledge advancements which revolutionized how medical care is delivered in

combat. Some of the USAISR's most notable contributions over the past twenty years include the development of the Combat Application Tourniquet, advances in Damage Control Surgery and Resuscitation, the introduction of the Burn Navigator decision support tool, and the novel use of blood products at the point of injury, to name a few.

The ability to achieve these lofty accomplishments have not been easy since early 2020. The COVID-19 pandemic impacted our organization just like it did many others around the world. Our staff demonstrated their tremendous agility by learning to work remotely, collaborating across virtual platforms, and demonstrating the ability to continue our important research and patient care missions without missing a beat.

The pandemic also created new opportunities for the USAISR to serve the nation. When the rising number of hospitalized patients in south Texas threatened to overwhelm Brooke Army Medical Center (BAMC), the USAISR mobilized the entire team to convert our vivarium into a 70-bed human hospital. We also deployed enlisted Soldiers in 2020 to support a regional blood bank to collect samples of COVID convalescent plasma which was one of only a few available treatment options at the onset of the pandemic.

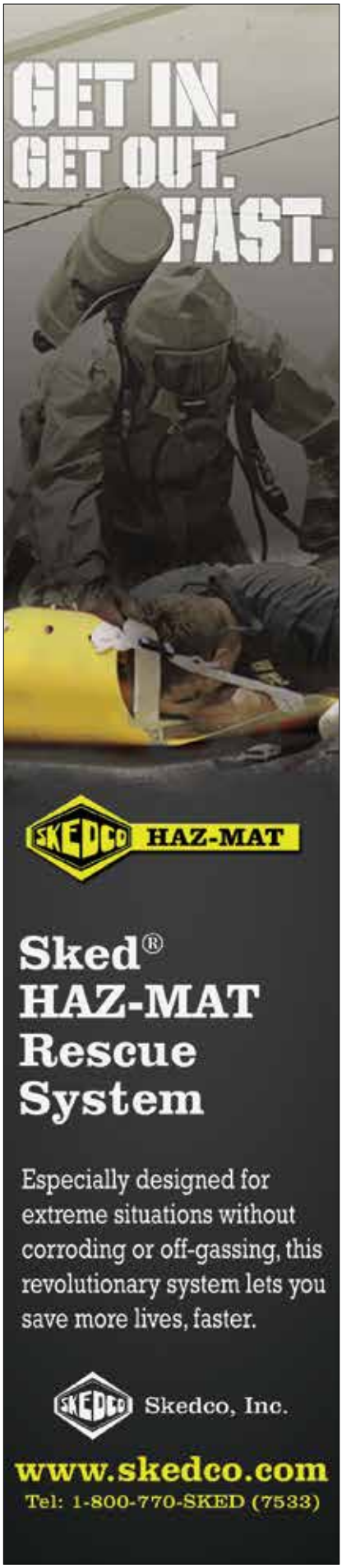
Our clinical team in the Burn Center expanded the scope of patients they care for as well. As a result of the Burn Center's unique expertise in Extra-Corporeal Membrane Oxygenation (ECMO) therapy, the physicians, nurses, and other health care staff provided this advanced life support therapy to numerous critically ill patients with COVID-19 infection. The USAISR Burn Flight Team, the military's only rapid deployment medical team specializing in the care of burn patients, leveraged its critical care expertise to support the transport of over 36 patients suffering from severe COVID-19 infection from locations around the world back to BAMC for ongoing care. It is this type of ingenuity and innovation which highlights just how blessed the Army is to have such a group of dedicated personnel within its ranks.

C&CC: How is the USAISR preparing to address the challenges of the future battlefield and what new capabilities is the organization working on currently?

COL Stackle: The unique combination of the USAISR's robust basic science capability coupled with the USAISR Burn Center creates an irreplaceable synergy that allows for rapid transition of research to the bedside and to the battlefield. From a combat casualty care research perspective, we must conduct combat casualty care research that is driven by Army requirements, and involves research projects which deliver knowledge and materiel products that are effective evidence-based combat casualty care solutions for the Warfighter.

As outlined in the National Defense Strategy and its supporting documents, we understand that military doctrine is shifting away from the counter-insurgency operations we conducted in Iraq and Afghanistan toward Large Scale Combat Operations in a Multi-Domain Operating environment. Our nation's focus on competing with more capable adversaries means significant changes in the medical challenges which will be found on the future battlefield. We have to adjust our paradigm of research away from injuries by improvised explosive devices, rocket repelled grenades, mortars and small arms to more sophisticated and lethal weapons. We also have to keep in mind that the past conflicts consisted of low casualty numbers and rapid evacuation of casualties to surgery. We must shift our thinking to a new set of scenarios which will involve high casualty densities with delayed evacuation to surgical care.

In a Multi-Domain Operating environment our troops will be faced with varied threats like cyber weapons, long-range precision fires, and robust enemy aerial defenses. The impact of these threats will be a requirement for widely distributed forces which will likely face impaired communication and situational awareness. There will be contested air



evacuations and increased distances to protected support areas where Role 3 hospital will likely be located. As a result of this complex and contested operating area, casualty evacuation may be delayed for 72 hours or longer.

In order to address these new challenges, the USAISR has re-organized our combat casualty care research teams to optimize our research. We have streamlined our research into six combat casualty care research teams or CRTs in what we call the 5+1 Pillars Model. We created five physiologic focused teams (pillars) plus a sixth team that provides overarching support to the other teams. The six CRTs are: CRT1—Blood and Shock Resuscitation; CRT2—Hemorrhage and Edema Control; CRT3—Organ Function Support; CRT4—Combat Wound Care; CRT5—Pain and Sensory Trauma Care; and CRT6—Engineering, Technology, and Automation whose efforts span all the other CRTs.

The mission of CRT1 (Blood and Shock Resuscitation) is uniquely focused on delivering solutions to decrease mortality and morbidities on the battlefield by leveraging efforts towards cellular hemorrhage control, prevention of hemorrhagic shock, and development of products and approaches to resuscitate combat casualties. Our current efforts include:

- Anti-shock drugs (e.g., prolyl hydroxylase domain inhibitors)
- Engineered whole blood alternatives

The mission of CRT2 (Hemorrhage and Edema Control) is to improve mortality and morbidity of combat casualties by (1) controlling hemorrhage from bleeding wounds; and, (2) preventing thrombo-inflammation and edema formation following traumatic injury. Their current efforts include:

- Control of non-compressible hemorrhage before a casualty reaches surgical capability (e.g., partial resuscitative endovascular balloon occlusion of the aorta (REBOA), novel hemostatic agents)
- Optimization of microvascular stabilization using plasma, tranexamic acid (TXA), other resuscitation adjuncts (e.g., bradykinin antagonists, angiopoietin/TIE2 modulations, Protein C pathway) to prevent thrombo-inflammation, compartment syndrome, and wound progression

The mission of CRT3 (Organ Function Support) is to deliver materiel and knowledge products that enhance Soldier survival at the point of injury and during prolonged care outside of a hospital. CRT 3's focus is on the mitigation of organ dysfunction resulting from traumatic injury. Their current efforts include:

- Biologically friendly partial organ support through the development of improved and safer anticoagulants and surface coatings

The mission of CRT4 (Combat Wound Care) focuses on improving

outcomes of soft tissue injuries, fractures and burns. The goals of CRT4 include the prevention of infection in complex wounds such as open fractures, reducing the loss of tissue from compartment syndrome, and stabilizing and offloading lower extremity injuries. CRT4 also focuses on burn related research including the prevention of wound infection, the prevention of burn progression and conversion, and the development of nonsurgical debridement solutions. CRT4's current efforts include:

- A drug-loaded dressing that assists hemostasis, prevents infection and improves the wound healing process
- An exoskeletal support frame to re-align, immobilize and off-load long bone fractures

The mission of CRT5 (Pain and Sensory Trauma Care) is to identify novel approaches for treating trauma-induced pain as well as research to repair and restore the sensory system (Ocular and Auditory trauma). This group's efforts include:

- Multimodal approach for battlefield pain control with reduced physiological or cognitive impairment
- Technologies to support semi-automated placement of regional analgesia catheters (e.g., Ultrasound-guided femoral nerve block)

The mission of CRT6 (Engineering, Technology, and Automation) is to develop, test, and validate new medical devices and systems that make use of state-of-the-art technologies in automation, advanced displays, artificial intelligence/machine learning, robotics, telemedicine, and computer vision to improve outcomes of combat casualties in combat scenarios where the prolonged care of numerous casualties is necessary. CRT6's "Paradigm-changing" efforts include:

- Technology to support semi-automated vascular access and regional analgesia
- Enhanced image processing-based ultrasound intervention guidance and diagnostics
- HoloLens/ Integrated Visual Augmented System-integrated diagnostic signal fusion, decision support, patient documentation

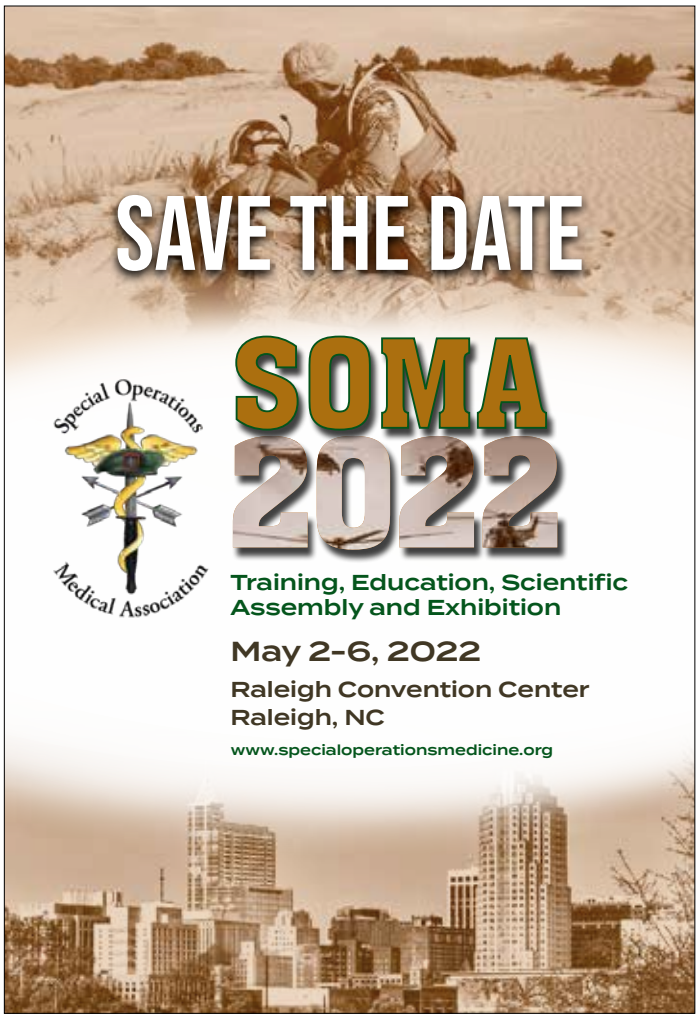
With this reorganization and its emphasis on a multi-disciplinary team approach to research, we are confident that we are poised to support the Warfighter and continue to provide the combat casualty care materiel and knowledge products for prolonged field care in a Multi-Domain Operating environment.

C&CC: What are some of the innovations USAISR is focused on for future battlefields?

COL Stackle: Our fundamental challenge moving forward is how we will be able to preserve recent gains in battlefield survival without rapid access to blood and surgery. The biggest reason for our reorganization into the six CRTs I mentioned is because we know that we can't just continue doing what we've been doing for the past two decades. We need some revolutionary breakthroughs to maintain anything close to the high survivability rates of our recent wars in the Middle East.

Progress in trauma care has been slow and incremental in recent years, and we absolutely must achieve transformational progress to address the more complex and more lethal battlefield of the future. In a Multi-Domain Operating environment, medical evacuation times will be prolonged, there will be larger numbers of casualties and there will be limited access to lifesaving interventions such as blood transfusion and surgical care. In this environment, we will not be able to achieve 90 percent plus survival rates that we achieved in Iraq and Afghanistan with our current capabilities. As a result, our goal at the USAISR is to extend the pre-hospital survival window from the "golden hour" to the "golden day" for as many casualties as possible using new approaches to keeping tissue viable; preventing and treating wound infection; controlling pain; and most importantly, keeping Soldiers in the fight.

Achieving the goals outlined above will not be easy. The challenge facing our team of dedicated clinicians, scientists and researchers is an immense one. We believe, however, that our '5+1' Research Pillars Model, which organizes our research efforts around the physiology of trauma, gives us the best chance to achieve some of those transformational breakthroughs we need.



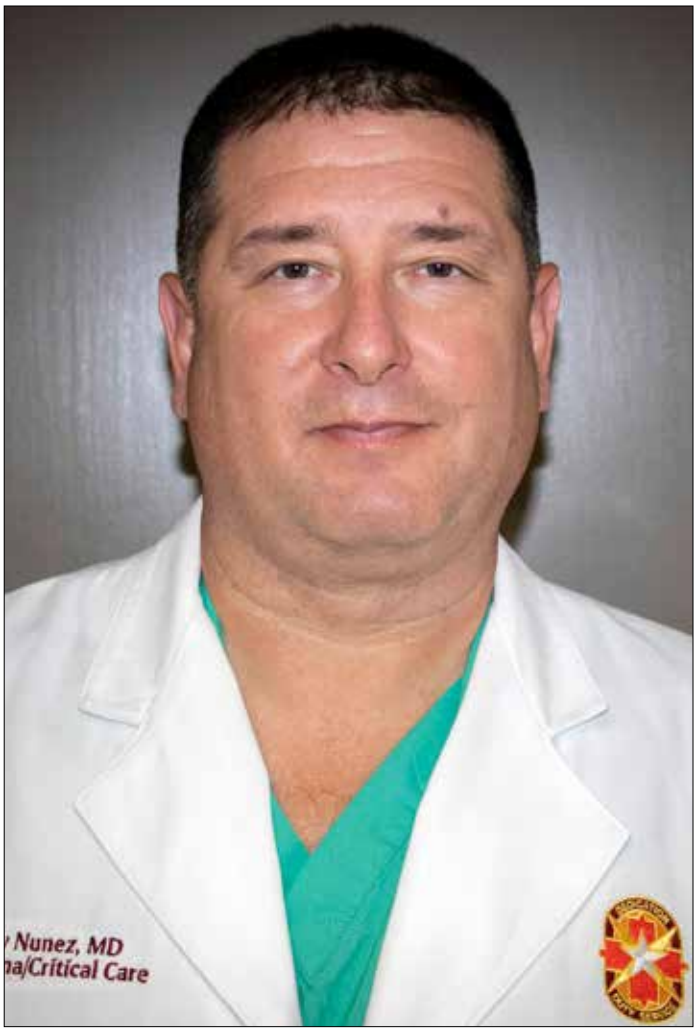
PARTNERING IN CRITICAL CARE PROJECTION

Timothy Nuñez, MD, MMHC, FACS is currently Professor of Surgery in the Department of Surgery, at F. Edward Hébert School of Medicine, Uniformed Services University of the Health Sciences. He is Chief of the Division of Trauma & Surgical Critical Care at Brooke Army Medical Center. Prior to his arrival at BAMC he was on faculty at Vanderbilt University School of Medicine in the Division of Trauma, Emergency Surgery and Surgical Critical Care. He received a Masters from Vanderbilt University Owen Graduate School of Management. From 2001-2011 he was an active duty Army General/Trauma surgeon. He is board certified in general surgery and surgical critical care. He completed his fellowship training at Vanderbilt University Medical Center and his general surgery training at The Good Samaritan Hospital, Cincinnati Ohio.

Combat & Casualty Care had the opportunity to speak with Dr. Tim Nunez, head of Brooke Army Medical Center's Trauma & Surgical Critical Care Division regarding areas of focus and challenge in meeting today's combat medical care mission.

C&CC: What are your primary responsibilities as Chief, Division of Trauma & Surgical Critical Care?

Dr. Nunez: To understand the duties of the Chief of Trauma at Brooke Army Medical Center (BAMC) you need to understand the history and the unique mission of trauma at BAMC. The Division of Trauma at BAMC is unique compared to all the other divisions and departments at BAMC. The Trauma Division is the largest division in the Department of Surgery and is responsible for the mission of caring for civilian trauma patients. At least 85% of the patients that are cared for by the division are civilian non beneficiaries. BAMC started taking civilian trauma patients in 1996 as part of an agreement with the Bexar County Texas Hospital District. In 1996 the trauma mission for South Texas was shared by University Hospital, Wilford Hall Medical Center, and Brooke Army Medical Center. In 2009 due to Base Realignment and Closure (BRAC), Wilford Hall and BAMC combined into one trauma center at BAMC. Since BRAC, the growth of trauma at BAMC has been exponential. Over the past decade the trauma volume has increased 264%. To participate in the care of civilian trauma patients in Texas, BAMC needs to be compliant with the State trauma rules. My role has a clinical, academic and administrative role. My job is to serve as a subject matter expert in trauma care. I am working to develop trauma medical leaders from an outstanding group of young surgeons. I work very closely with the assistant chief of Trauma/Trauma Medical Director to make sure we adhere to the high standards set by the American College of Surgeons.

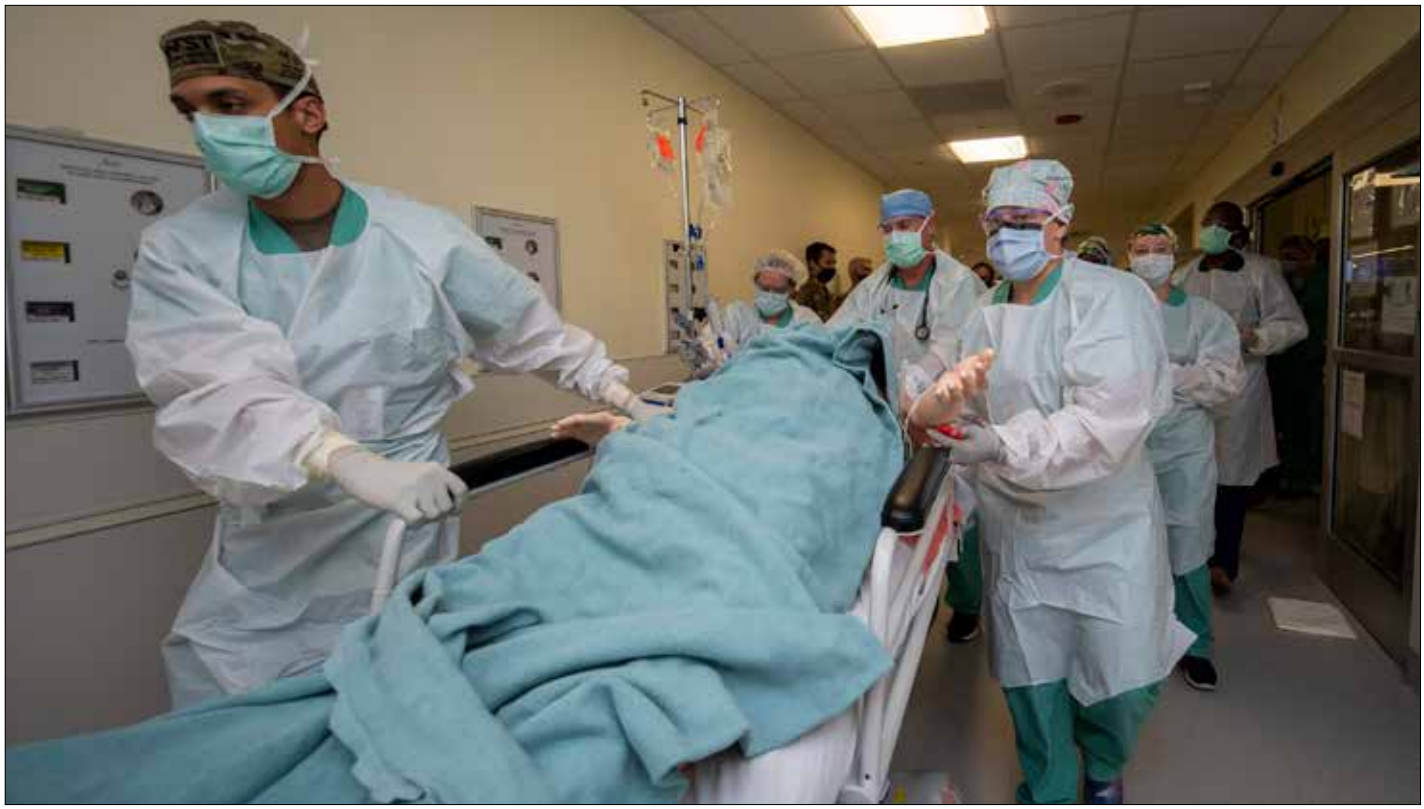


Dr. Timothy Nunez

Chief
Division of Trauma & Surgical Critical Care
Brooke Army Medical Center

C&CC: From a trauma care perspective, speak to some key evolutions you've seen take place in the last decade or so.

C&CC: Key evolutions largely driven by military medicine have been hemorrhage control and resuscitation of trauma victims. It is common that we learn to take care of trauma patients from war time injuries; this has been no different over the past twenty years. We have really focused on what we resuscitate a patient with, providing a much more balanced resuscitation with far less crystalloids. This focuses on what the patient is losing, which is blood and clotting factors. So this balanced resuscitation uses blood products much earlier than we were taught 20-30 years ago. We have also pushed forward to the first responder, combat medic and bystanders the need for hemorrhage control. The American College of Surgeons has worked extensively to push out and teach hemorrhage control to non-medical personnel with the creation of the Stop the Bleed Course. Tourniquets and bleeding kits are becoming prevalent in the community just as AED did after being pushed by the American Heart Association.



Members of the 555th Forward Surgical Team rush a simulated trauma patient to surgery during training with the Strategic Trauma Readiness Center of San Antonio (STaRC) at Brooke Army Medical Center, Fort Sam Houston, TX. The STaRC training program leverages the expertise and capabilities across multiple healthcare disciplines at BAMC, the U.S. Army Institute of Surgical Research, the Medical Center of Excellence, the Joint Trauma System and the Air Force 59th Medical Wing to provide deploying surgical teams with the most realistic and comprehensive wartime skills certification. (U.S. Army photo by Jason W. Edwards)

C&CC: From a surgical care perspective, what types of advances do you see as critical to positive outcomes not seen even just a decade ago?

Dr. Nunez: It is hard to separate out surgical care from trauma care. They are essentially the same when it comes to the management of injured patients. For not emergent care the instrumentation and technique with the use of laparoscopic and robotic tools has greatly expanded surgical approaches. This type of minimally invasive specialized surgical skills is prevalent in health care but not that prevalent in trauma surgical circles. The use of advanced minimally invasive techniques have not grown substantially in the trauma surgical practice

C&CC: In terms of any recent advances in mobile trauma or surgical care, can you speak to any trends? The biggest trends are in the prehospital management of major injury, again pushing the care of the patient far forward.

Dr. Nunez: Training medics, paramedics, and prehospital physicians advance techniques such as airway management, hemorrhage control and major surgical procedures. Some EMS systems have moved forward with surgical procedures prehospital, these procedures can be controversial and are not widely practiced at this time. However in mature, well-run regional systems, this type of care can be standardized and implemented well. These type of advanced surgical techniques need the entire system (EMS, Regional trauma system, trauma centers) on board in the implementation and maturation of these procedures being introduced prehospital.

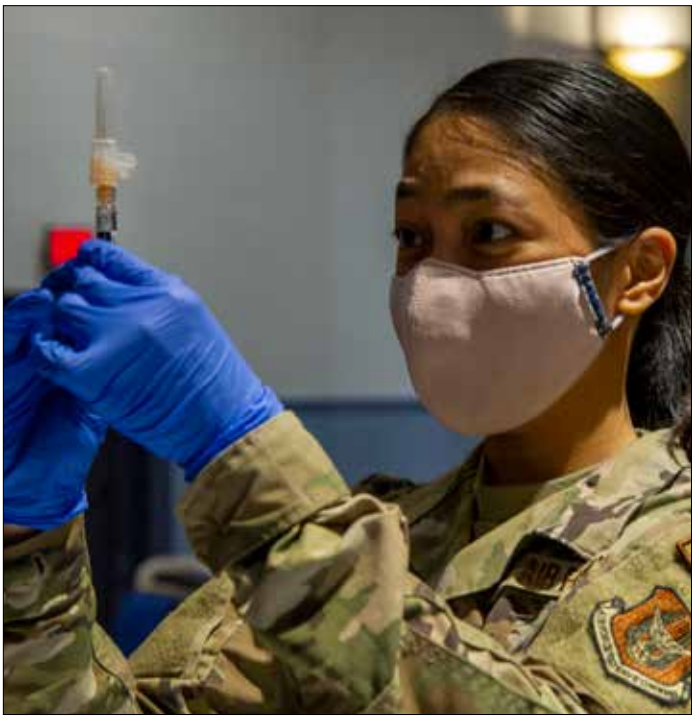
C&CC: Feel free to add any comment on achievements/goals moving forward.

Dr. Nunez: BAMC has been a trusted partner in the regional trauma system of south Texas for 25 years. This relationship cannot be highlighted enough to demonstrate the readiness value that this trauma center provides to military health care personnel. BAMC has shown that every member of our health care team gets readiness touches from our institution's dedication to the care of trauma patients. Furthermore, during the pandemic BAMC was able to clearly show its value as a member of our regional trauma system. Due to the overwhelming nature COVID-19 attacked the community, BAMC increased trauma volume to offload our civilian partners from the burden placed on their need for space to accomdate the increased number of COVID patients. For over 5 months covering 3 separate surges of COVID, BAMC increased trauma volume by over 35% to maintain the integrity of our regional trauma system. During this same time we developed a state of the art predeployment platform for deploying teams that included hands-on clinical care at BAMC.

ADDRESSING TRADITIONAL NEED AMID PANDEMIC CONTINGENCY

Defense Logistics Agency Troop Support has and continues to provide flu vaccines to warfighters despite ongoing efforts to mitigate global COVID-19 supply challenges.

By John Dwyer III, DLA Troop Support



Senior Airman Karen Crisotomo, a medical technician assigned to the 446th Aerospace Medicine Squadron, prepares a vial of the seasonal influenza vaccine, commonly known as the flu shot at Joint Base Lewis-McChord, Washington. Communicating and coordinating with military and industry partners throughout the acquisition and delivery cycle is the key to the Defense Logistics Agency Troop Support Medical supply chain's ability to deliver annual flu vaccines across the globe in support of warfighters' readiness. (U.S. Air Force photo by Maj. Candice Allen)

The "secret to success" of the Defense Logistics Agency's flu vaccine program is no secret at all: early, often and accurate communication with customers and industry partners.

While some years are better than others, and there are many factors that can influence when vaccines are delivered to military customers, communicating early and often are keys to a good year, DLA Troop Support's Pharmaceutical Manufacturer/Distributor Division Chief Alexander Quinones said.

COMMUNICATING EARLY: SUCCESS IN ACQUISITION

Historically, contracts were awarded in the summertime just before the start of flu season and often left DLA short on options and competitive pricing, Quinones said. This year, communications started earlier than ever in July 2020.

Quinones' team recognized that by starting earlier and using previous year averages to open bidding on the services' needs, they could improve their position heading into the next year's flu program – a win for the warfighter and the DLA team, he said.

By taking this approach and involving partners at the Defense Health Agency early in the decision process, DLA was able to "get in line" earlier with vendors, allowing more flexibility and options for products and quantities. It also gave the military services time to gather their requirements for 2021 within the expedited timeline.

The head start also provided flexibility in negotiations despite an aggressive delivery timeline. DHA's Immunization Healthcare Division provision of early, accurate requirements further enabled the earliest flu award ever on Feb. 23, 2021.

"Now, we're four, five, six months ahead of where we used to be, putting ourselves in a better place for competition with more industry partners," Quinones said.

COMMUNICATING OFTEN: SUCCESS IN DELIVERY

Early delivery is always a goal, but it's a balancing act against summer weather in advance of flu season.

"We don't like to bring it in too early... because the higher temperatures don't allow us to ship to everyone worldwide," Quinones said.

Higher ambient temperatures wear on the product faster and make it difficult to get to certain places, making temperature management a vital part of the logistics process, DLA cold chain management expert Dana Dallas said.

"For our [Department of Defense] customer base...if it isn't done correctly, it can ruin critical supplies and negatively affect DOD's ability to support warfighters, retirees and their families," Dallas said.

To mitigate the challenge, Quinones and his team participated in weekly calls with the IHD to manage deliveries and expectations.

"We were able to use staggered shipments to [DLA Distribution's] depot and it's been working," Quinones said.

COMMUNICATING PRIORITIES: SUCCESS IN READINESS

As different products are received at the depot, deliveries are made depending on a combination of considerations including when they arrive, and how they are prioritized on the schedule provided by the IHD and services.

"It's about the product line that's delivered first [multi-dose vials, prefilled syringes, or other vaccine products], then the priority," Quinones said. "It's up to the services to tell [DLA] what to push where."

The flu vaccine, as part of the overall Medical mission within DLA Troop Support, is vital to readiness and something that the team takes to heart, Medical Director Army Col. Matthew Voyles said.

"Keeping the warfighter medically ready to fight anytime, anywhere is what we do, and our team takes that mission very seriously," Voyles said. "It's never 'you can't do it without us.' It's always, 'we can't do it without each other.'"

RESTORING INDEPENDENCE

A leader in upper-limb assistive technology has introduced a software-driven wearable device to help patients with spinal cord injuries (SCI) achieve greater mobility.

By Shawna Persaud, Ph.D., Abilitech Medical

Nearly 18,000 Americans suffer a spinal cord injury, or SCI, each year. That means that more than two people every hour may lose sensation and control of movement below the area injured from an auto accident, a fall, a sports injury, a gunshot wound, or some other incident.

Veterans, as it turns out, comprise a disproportionately large number of U.S. SCI patients. Among the estimated 294,000 patient population, roughly 42,000 (14%) were among the armed services at one point. The Department of Defense similarly estimates that the VA cares for 10-20% of all SCI patients in the country.

Not all these former service members' injuries were war-related, but for those that were, medical professionals regard their cases as more severe and complex than SCIs involving civilians. And with nearly half of all SCIs occurring in people between the ages of 16 and 30, many live with the effects of these injuries for decades.

Richard Kutt credits the Abilitech Assist for saving his arm and restoring his arm movement. (Abilitech Medical)

ASSISTIVE DEVICES

SCI patients who often must work exponentially harder and longer to achieve the straightforward tasks (clinicians call them activities of daily living or "ADLs") most take for granted. To support their daily life, assistive technologies have become invaluable.

Many of these technologies help individuals ambulate, but thousands of SCI patients also have upper-limb weakness. With only partial strength in their shoulders, elbows, or arms, they can't independently perform crucial ADLs like combing their hair or lifting eating utensils to their mouths. They rely on caretakers, now in radically short supply in our current workforce, for these tasks.

HELPING ARM MOVEMENT

Recently, an innovative new powered orthotic device was listed with the FDA and made commercially available to help people with upper extremity weakness regain function and independence.

The Abilitech Assist, a lightweight wearable device assisting both the shoulder and the elbow, leverages specially designed springs, motors, and software to support individual patients without overriding their existing function. The technology allows patients to adjust the level of support they needed, using the science of counterbalance to offset gravity and make their arm, plus an object of up to 12 ounces, feel virtually weightless.

For Richard Kutt, who began using the Abilitech Assist earlier this year, the technology has literally and figuratively opened doors in his life. Kutt began serving in the U.S. Army in 1987 but severed his spinal cord in a head-on collision with a tractor trailer in 1989 as a civilian near his home in Quakertown, Penn.

Living as a paraplegic for the last 30+ years has been difficult for Kutt, but he's benefited greatly by his spirit of determination and the care from his wife, Natalie, who has been by his side every lift, grab, and hold along the way.

Now life is becoming a bit easier for the family. Kutt determined that the Assist would succeed for his left arm in a single clinical visit.

"The device has actually saved my arm," Kutt noted. "Doctors said my arm would be totally useless in three months to a year, but, with the device, I am getting some strength and movement back. I enjoy wearing it and it's comfortable for me."

A NEW VIEW

Abilitech Medical, Inc. was founded in 2016 by a team of individuals experienced with upper-limb impairments. The group saw an unmet need to facilitate better arm movement and set out to develop technology to not only help patients surpass physical hurdles, but social, emotional, and economic ones, too.

SCI patients commonly experience secondary health issues ranging from cardiovascular and circulatory problems, respiratory failure, bladder dysfunction, pressure ulcers, impaired swallowing, and more. These complications, often appearing well after patients have stabilized from initial injuries, may confuse those less familiar with the condition and create additional barriers to engaging in the workforce, joining community activities, or having more and deeper friendships and relationships. People falsely assume a patient's predicament is more than an injury and shortchange their opportunities.

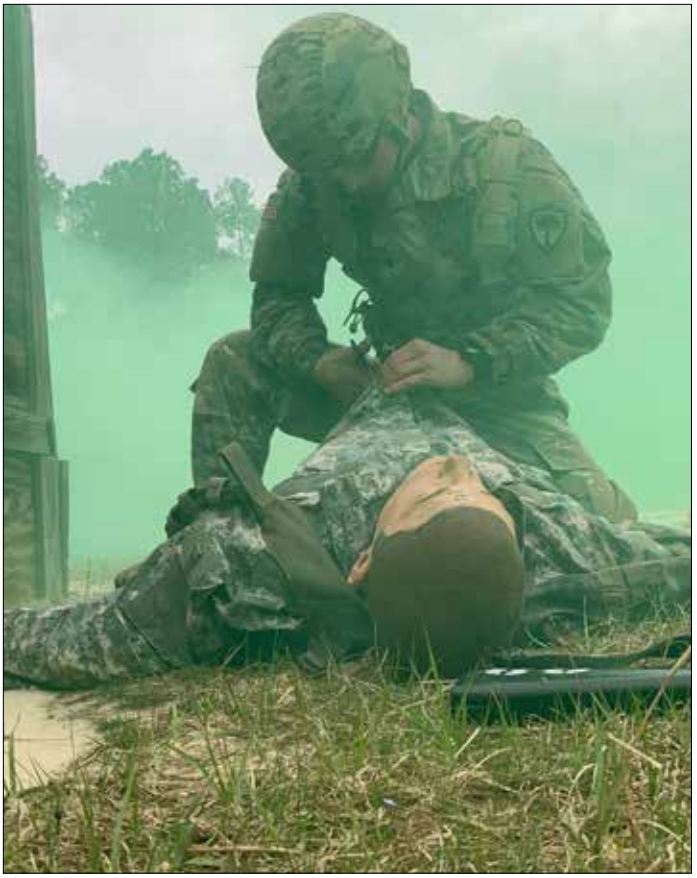
Abilitech Medical hopes its technology will bring about a virtuous cycle of wellness with increased mobility that may lead to improved hygiene and function as well as social, emotional, and economic gains. Ultimately, it aims to change how the world fundamentally views and treats neuromuscular conditions or injuries.

More Info:
Abilitech Medical: www.abilitechmedical.com
Paralyzed Veterans of America: https://pva.org

TAKING MEDICAL SIMULATION TO THE NEXT-LEVEL

Based in the heart of Kentucky, North American Rescue (NAR) Simulation engineers a broad spectrum of simulators that support training in realistic austere environmental conditions where operators deliver care.

By Adam Reading, North American Rescue, Inc.



A soldier medic tends to a simulated casualty at the 2021 South Carolina Army National Guard (SCARNG) Best Medic Competition. (Photo credit: SGT Corey Outen - SCARNG Medical Training Team)

North American Rescue (NAR) Simulation was founded with the goal of creating products that support warfighter training in the harsh environments that missions are typically performed. The equipment is engineered to function in extreme temperatures, endure rough handling, and provide an unparalleled level of realism. NAR Simulation independently researches and develops products based on detailed recommendations ranging from field educators, subject matter experts, project management offices, and most importantly, the end-user. Strategic partnerships with metal fabrication shops and silicone manufacturers / molders complements our in-house engineering team's rapid prototyping capabilities.

BROAD MILITARY APPLICATION

From our early years of research and development, NAR Simulation has dramatically expanded our product lines, engineering capabilities, and manufacturing techniques – firmly establishing NAR Simulation as the industry leader in full mission profile training simulators. Our products range from elementary part task trainers to complete simulation training centers equipped with human and canine trauma simulators, integrated virtual and augmented reality elements, force-on-force trainers, special effects machines, casualty evacuation (CASEVAC) platforms, and multi-room camera capture / debriefing capabilities. With thousands of simulators deployed around the globe, NAR Simulation products are essential training tools for our nation's warfighters.

COMBAT CASUALTY-FOCUSED CAPABILITY

NAR Simulation supports military field training, civilian disaster response, and public safety teams for greater than 1,000 trainees annually. Realistic depiction and treatment of traumatic injuries remains a critical element in preparing warfighters. Remote control operation of simulators enable cadre to remove student dependency on "over-the-shoulder" training injects (e.g., "the patient says he cannot breathe"). Simulators that respond to proper clinical interventions, such as tourniquet application, facilitate experiential learning that supports didactic theory.

Thousands of TOMManikins are deployed globally, as well as many helicopter simulators, to both continental U.S. (CONUS) and outside continental U.S. (OCONUS) locations.

TARGETED NEEDS TRAINING

NAR Training, LLC (NAR Training) was founded to provide quality, relevant, evidence-based medical education and training to the DoD and other customers. NAR Training's medical curricula comply with the principal concepts and clinical practice guidelines of the DoD's Joint Trauma System for Tactical Combat Casualty Care (TCCC) and Prolonged Field Care (PFC). NAR Training regularly conducts medical training for military special operations units, including Prehospital Tactical Life Support (PHTLS) and Tactical Emergency Casualty Care (TECC).

NAR Simulation Mission Qualification Training Product Lines:

- Battlefield / environmental effects simulators
- Clinical monitoring simulators & mixed reality equipment
- Helicopter and fixed-wing CASEVAC simulators & aircraft and vehicle salvage simulators
- Human and canine trauma simulators
- Simulation training centers
- Student biometric monitoring

LOOKING AHEAD

NAR Simulation is dedicated to listening to the boots on the ground end user for product development and improvement. Complex field training and scenarios require equipment engineered with outside the wire experience. Your training mission is our mission.

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NEXT LEVEL

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DYNAMIC CASUALTY ASSESSMENT

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- *Interact with progression of injuries over time*
- *Integrate with NAR Simulation's* ***TOMManikin*** *| Patient Monitoring Suite*

BUILD THE CONFIDENCE TO ACT

- *Recognize critical signs and symptoms*
- *Reinforce current CoTCCC Medical Guidelines*
- *Practice patient assessment and physical medical skills*

TRAIN MORE STUDENTS IN LESS TIME

- *Present a scenario in seconds*
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- *Track student performance with real-time data capture*

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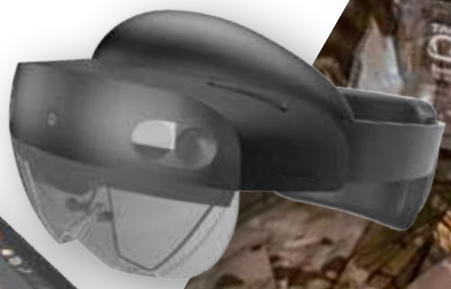

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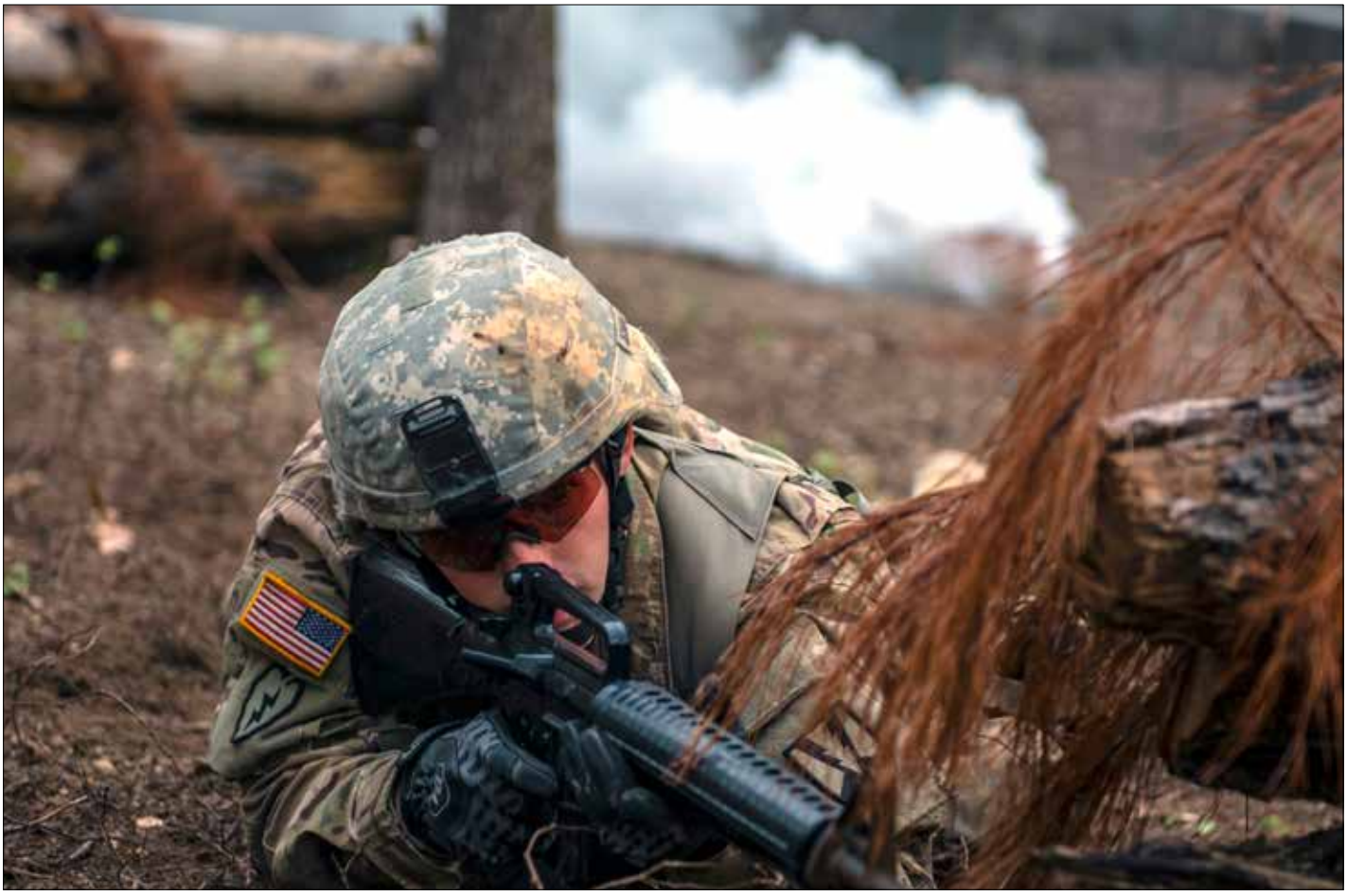
DETECTING TRAUMATIC BRAIN INJURY ON THE BATTLEFIELD

The U.S. Army Medical Materiel Development Activity (USAMMDA) Warfighter Brain Health Project Management Office (WBH PMO) develops and delivers brain health medical solutions — across the continuum of care — that aid in the prevention, detection, and treatment of neurotrauma, and in the psychological health and cognitive performance of America's Servicemembers.

By LTC Stuart S. Hobbs and Louis E. Jasper, WBH PMO



Staff Sgt. James Smith, 3rd Battalion, 39th Infantry Regiment, scans the terrain while searching for his next position while taking direct fire during Expert Infantry Badge testing, Ft. Jackson, SC. Soldiers vying for the coveted Infantry qualification were given 30 timed Army Warrior tasks to complete in addition to being tested on the Army Physical Fitness test, day and night land navigation. Testing ended with a 12-mile forced march. (U.S. Army photo by Sgt. 1st Class Brian Hamilton)

The mission of the U.S. Army Medical Materiel Development Activity's (USAMMDA) Warfighter Brain Health Project Management Office (WBH PMO) is to develop and deliver brain health medical solutions — across the continuum of care — that aid in the prevention, detection, and treatment of traumatic brain injury (TBI), and in the psychological health and cognitive performance of our U.S. Service Members. Put simply, we deliver brain health products to the U.S. military that save lives, return Warfighters to duty, optimize their performance, and make them whole again. With a rise in the occurrence of TBI in the field, our WBH PMO team has been working with several commercial partners to develop field-suitable, operationally relevant capabilities. Most notably, our government/industry co-development team has recently achieved U.S. Food and Drug Administration (FDA) marketing clearance for a rapid blood plasma biomarker assay on a portable instrument to aid in the evaluation of TBI casualties in operations. This capability is now commercially available.

EARLY DIAGNOSIS KEY TO GREATER RECOVERY

Enabling earlier detection and assessment of TBI results in reduced casualty evacuations and improved triage to maximize positive outcomes for impacted casualties. Product managers Dr. Krista Caudle, Dr. Malena Rone, and LTC Stuart Hobbs along with the Integrated Product Team (IPT), have done a fantastic job of working with our commercial partner, Abbott, to develop this now commercially-available, FDA-cleared, blood plasma biomarker assay to aid in the evaluation of TBI in the field. The interpretation of test results is used, in conjunction with other clinical information, to aid in the evaluation of patients, 18 years of age or older, presenting with suspected mild traumatic brain injury (Glasgow Coma Scale score 13-15) within 12 hours of injury, to assist in determining the need for a computed tomography (CT) scan of the head. A "Not Elevated" test interpretation is associated with the absence of acute traumatic intracranial lesions

USAMMDA's Warfighter Brain Health Project Management Office has worked with its commercial partner Abbott in the development and field testing of the i-STAT Alinity Point-of-Care device. The i-STAT Alinity is an easy-to-use, portable blood analyzer that delivers real-time, lab-quality diagnostic test results. The device utilizes an intuitive interface that simplifies the testing process, allowing for minimal operator training, and features very sturdy construction to help resist damage in the field. (Abbott imagery)

visualized on a head CT scan. Ultimately, this means that if a casualty in the field has a negative result for this assay, and he or she has no "red flags" per existing clinical practice guidelines, then he or she will not need to be evacuated to a higher role of care for advanced imaging to assess the presence of a brain injury.

As a result, this test has the potential to preserve the fighting force, significantly reduce the number of evacuations for an injury type that is common in kinetic operations, and also reserve the use of advanced imaging for casualties with more severe brain injuries. The currently FDA cleared test is laboratory based because of blood processing required to run the test; however, Abbott is also working on a whole blood test, which would eliminate the need for separation of plasma and could be used at the patient's side in a clinical setting.

SUPPORTING AN EVOLVING OPERATIONAL FOCUS

Recently, there has been a shift in strategy with a focus on preparing medical materiel for large-scale, joint, combat operations. This shift has far-reaching implications for our military, and it has certainly resulted in the WBH PMO re-thinking how we can best serve the future needs of our Service members and field medical providers. Consequently, our integration with the U.S. Army Medical Research and Development Command's science and technology base and other stakeholders, is more important than ever. We're working together with these stakeholders to plan for the future, and we're restructuring our programs to meet the future needs of our military.

Detection of a TBI, determining its severity, and guiding treatment as close as possible to the point of injury continues to be a goal in the development of future TBI assessment capabilities. USAMMDA's WBH PMO has a program to develop non-invasive monitoring solutions for TBI in the field. At this time, there is very limited capability to monitor and treat TBI near the point of injury, in casualty evacuation, and at Role 1 (immediate first aid at point of injury) or Role 2 (limited medical care facility). A consequence of this limited capability during counter-insurgency (COIN) operations has been aggressive and early evacuation to a Role 3 (highest level of medical care within the combat zone) facility with neurosurgical augmentation. During recent COIN operations, severe TBI casualties could be evacuated to neurosurgical care nearly as quickly as in a stable civilian setting. This evacuation time frame may not be possible, however, during large-scale combat operations. Bringing monitoring and management capabilities further forward could preserve resources and permit more finely tailored triage and management, allowing continued operations in a resource-constrained environment that is not permissive to typical evacuation times or routes.

FORGING A PROMISING FUTURE

As we continue to partner and work with the Combat Casualty Care Neurotrauma Portfolio, and actively watch the research and industry communities for emerging solutions, we feel confident that monitoring technology candidates will mature and provide a capability for monitoring and treatment of TBI at far-forward roles of care once a TBI has been diagnosed.

CALENDAR OF EVENTS

JAN 18 – 22
Shot Show
Las Vegas, NV
Shotshow.org

FEB 7 – 10
AMSUS in person
National Harbor, MD
Amsus.org

FEB 8 – 9
Air Force Contracting Summit
Miramar Beach (Destin), FL
usdlf.org/air-force-contracting-summit

FEB 16 – 17
Military Aviation & Air Dominance Summit
Huntsville, AL
Aviation.dsigroup.org

FEB 20 – 25
AMSUS – ***Virtual***
Amsus.org

MAR 16 – 17
Unmanned Systems & Robotics
National Harbor, MD
Unmannedsystems.dsigroup.org

MAR 28 – 29
Trauma Critical Care & Acute Care Surgery
Las Vegas, NV
Trauma-criticalcare.com

MAR 28 – 30
Medical Disaster Response
Las Vegas, NV
Trauma-criticalcare.com

MAR 29-30
Border Security Expo
San Antonio, TX
Bordersecurityexpo.com

MAR 29 – 31
Global Force Symposium
Huntsville, AL
Ausa.org/globalforce.com

APR 3-6
Sea-Air-Space
National Harbor, MD
Seaairspace.org

APR 12-13
Operational Medicine Symposium
National Harbor, MD
Operationalmedicine.dsigroup.org

MAY 2-6
SOMA 2022
Raleigh, NC
Specialoperationsmedicine.org

MAY 16 – 19
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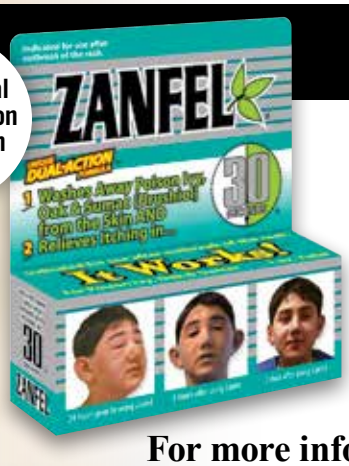

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- DLA VIPA Agreement: VMP-1412-03
- FSS Contract 65IIa/GSA Schedule - V797D-30127

NSN 6515-01-626-8691
Masimo PN 3639

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- Air Force Safe-to-Fly Certification
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