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Chairman Wilson, Ranking Member Davis and distinguished members of the subcommittee, thank you for the opportunity to appear before you to discuss the Army's research initiatives to improve Soldier readiness and resilience and highlight the incredible work of the dedicated men and women with whom I am honored to serve. On behalf of the over 150,000 dedicated Soldiers and civilians that make up Army Medicine, I extend our appreciation to Congress for the support faithfully given to military medicine, which provides the resources we need to deliver leading edge health services to our Warriors, Families and Retirees.

Strategic Overview: Invisible Wounds of War

The unprecedented length and persistent nature of conflict over the past eleven years have tested the capabilities and resilience of our Army. The longest period of war in our Nation's history has undeniably led to physical and mental wounds to the men and women serving in the Army – and to their Families. The majority of our Soldiers have maintained resilience during this period. However, the stresses of increased operational tempo are evident in the increased demand for Behavioral Health Services and high suicide rate. The Army is keenly aware of the unique stressors facing Soldiers and Families today and continues to address these issues on several fronts. Taking care of our own—mentally, emotionally, and physically—is the foundation of the Army's culture and ethos.

Traumatic brain injury (TBI) and post-traumatic stress disorder (PTSD) have been characterized in the public as the signature wounds of Operation Enduring Freedom and Operation Iraqi Freedom. While physical injuries may be easier to see, "invisible wounds" such as TBI, PTSD, and depression take a significant toll on our service members. And yet, to the individuals who suffer from these wounds, and those who care for them, they are anything but invisible. The Army and Army Medicine are actively engaged in reducing stigma and upholding our collective responsibility to raise national awareness regarding traumatic brain injury and mental health conditions including PTSD. We anticipate the need for mental health services will only increase in the coming years as the Nation deals with the effects of more than a decade of conflict.

Behavioral health problems, traumatic brain injury, and suicide, while often described as “invisible wounds of war,” are not unique to a theater of combat or to the military – they are National issues. Consistent with National and military health system goals, the Army seeks to further understand and improve the prevention, diagnosis and treatment of these conditions through clinical and scientific research - paving the way for improved health, function and quality of life for those with PTSD, TBI, and co-occurring conditions, and to reduce the incidence of suicide.

“Medicine is the only victor in War”

History is replete with examples of war serving as a catalyst for medical innovation and of battlefield medicine producing advances in civilian healthcare. Plastic surgery was a result of treating the horrors of mustard gas and facial wounds during World War I. The specialty of infectious diseases evolved from efforts to combat debilitating infections in the trenches during World War I. Blood management and utilization were greatly improved during World War II. Civilian life flight came from advances in helicopters and air ambulance doctrine started in Korea and honed in Vietnam. These wars have also led to tremendous advances in delivery of life-saving medicine on the battlefield. One of the unique features of these wars has been the intense attention on invisible wounds of war, and for the first time research has led directly to changes in how mental health services are delivered in the military.

A prominent example in the mental health arena is COL Albert J. Glass who served as a psychiatrist during World War II, the Korean War, and during the 1960s. He studied treatment of psychological trauma, forward treatment and the benefits of early assessment and ease of treatment. Following retirement, COL Glass wrote about preventive mental health care and noted "the more civilian psychiatry becomes oriented toward prevention, the more it has borrowed from the techniques of military psychiatry." He stressed the inclusion of patients in a non-cloistered area and noted that isolation from the community "often deepened a patient's psychological trauma." He and fellow colleagues changed the course of treatment for mental illness from isolation to that of inclusion with community centers replacing secluded sanitariums.

Medical research conducted by the U.S. Army continues to lead to advancements that benefit civilian medical practice worldwide.

Dealing with the Consequences of War

More than a decade of war has led to tremendous advances in knowledge and care of combat-related wounds, both physical and mental. The US Army Medical Research and Materiel Command (MRMC) is leading Army Medicine in scientific research. We have ongoing research focused on establishing more effective methods for diagnosis and treatment of the health-related consequences of war, including TBI, behavioral health care, PTSD, burn and other disfiguring injuries, chronic pain, and limb loss.

From 2001-2006, MRMC, predominantly through Army core funding, the Peer-Reviewed Medical Research Program and Congressional Special Interest earmarks, funded modest investments in psychological health (PH), traumatic brain injury, and suicide research totaling \$83M. Key studies that achieved National visibility included the Walter Reed Army Institute of Research (WRAIR) Land Combat Study, Mental Health Advisory Team research in Iraq and Afghanistan, and the 20-year longitudinal Millennium Cohort Study. These efforts led to greater awareness of the scope of the problem with particularly important findings related to stigma and barriers to care. This research led directly to policy changes, including the post-deployment health re-assessment (PDHRA), revision of combat stress control doctrine and treatment on the battlefield, and changes in health care delivery to reduce barriers. TBI research during this period focused mainly in characterizing the importance of this condition, developing blood biomarkers, researching neuroprotection strategies, and identifying a prototype screening tool that was ultimately added to the PDHA in 2008.

As the impact of the “invisible wounds” of the war became increasingly evident, Congress significantly increased funding for critical research. Since 2007, the total investment in Psychological Health alone is approximately \$716 million, supporting more than 400 research studies. The majority of these funds were from Congressional Special Interest (CSI) augmented by Core Defense Health Program (DHP) and Core Army funds. Of these research studies, approximately 60% support PTSD research

(\$427M, 257 studies), 17% support suicide prevention research (\$123M, 36 studies), 10% support resilience research (\$75M, 39 studies), 8% support Family related research (\$55M, 37 studies), 4% support military substance abuse (\$27M, 30 studies), and 1% support research to prevent violence within the military (\$10M, 4 studies).

The increase in TBI research funding has been equally significant. Since 2007, the investment in TBI research has totaled \$710 million and supported more than 500 research studies, with the majority of the funding directed at prevention, screening, diagnosis, and treatment. The majority of these funds were from CSI augmented by Core DHP and Core Army funds. Of the total TBI research studies, 26% support basic science and epidemiology Foundational Science (\$135M, 131 studies), 31% support prevention and screening (\$211M, 160 studies), 29% support clinical treatment (\$253M, 149 studies), 12% support follow-up care (\$70M, 59 studies), and 1% support service research \$5M, 6 studies) and 1% on post recovery (\$35M, 5 studies).

The Army is approaching the peaks of knowledge and deliverables from FY07 and FY08 PH/TBI research. From the initial 2007 and 2008 investment, approximately 124 studies have closed out and another approximately 250 studies are scheduled to be closed out by the end of calendar year 2014. Although the average time to translate research into clinical practice is typically more than 16 years, results from the initial studies funded in 2007 that are already informing the way we care for Servicemembers as well as new lines of research. Examples include validation and refinement of screening tools that are now used throughout the deployment cycle and primary care clinics, enhanced treatment efforts in primary care, and validation of new treatments such as the use of a blood pressure medication called Prazosin for nightmares associated with PTSD,

The past decade of research has guided health policy, clinical practice guidelines, preventions and treatment interventions. Multiple programs have been implemented in theater and post-deployment to enhance resiliency, address combat operational stress reactions and behavioral health concerns. However, early identification and treatment of PTSD and TBI remain two of the most challenging areas of wartime medicine. With

timely screening and the right treatment most Servicemembers and Veterans will go on to live productive, fulfilling lives. As a Nation, this is an opportunity for us to lead the way in breaking the silence – to encourage those who suffer behavioral health issue to ask for help. We have learned that combat stress and PTSD resulting from deployment are treatable and curable with proper care; and the majority of Servicemembers return to productive and engaging lives.

I would like to highlight a few policies and programs that are impacting health care of our Soldiers today which were guided by medical research efforts.

In the area of traumatic brain injury, research findings directly affected policy and changed the way the Military Acute Concussion Evaluation (MACE) is used and administered in the deployed environment. For example, the latest version of the MACE, released in 2012, now includes additional word lists to test memory as well as a component to test for balance deficits. Key neuro-imaging indications were incorporated within the concussion management algorithms from research published in the New England Journal of Medicine and three Magnetic Resonance Imaging (MRI) machines are currently in use in Afghanistan to advance TBI science. Commanders throughout Afghanistan have implemented a mandatory TBI screening and rest policy while medical providers and Concussion Care Centers facilitate provide proper treatment and recovery, resulting in a 98% return to duty rate.

Army Medicine collaborates with TBI experts to regularly update TBI clinical guidelines that reflect the latest scientific research and best practices. We have created a system to review and analyze the large number of research projects to identify promising findings that can be quickly translated into actionable policy or clinical practice.

The immediate goal in TBI diagnostics has been to identify the unique biological effects of TBI and leverage that knowledge to deliver more effective objective diagnostic tools to provide information on the presence and severity of brain injury. There is currently no objective diagnostic test to detect mild TBI. In the past 5 years over sixty different technologies have been evaluated to meet this challenge.

We are working on a capability for medics in austere combat environments to administer a simple test to detect TBI. The Biomarker Assessment for Neurotrauma Diagnosis and Improved Triage System (BANDITS) program is developing a blood test for brain cell damage, which may aid in the clinical assessment of patients with TBI. BANDITS has completed pilot and feasibility studies and has launched its pivotal trial which will enroll up to 2000 patients with mild, moderate and severe TBI. This capability has applications beyond the military and could be used to detect concussions in civilian sports environments.

Additionally, discovery efforts are underway to identify markers that can provide feedback on the effectiveness of treatments. Some markers may be able to perform multiple functions. A pivotal trial is now underway to evaluate new technology that uses quantitative electroencephalography as another potential diagnostic tool. Studies are also looking at smooth pursuit eye tracking in assessment of attention, vision and motor planning networks within the brain. One problem with TBI measures is that they may also show changes for other reasons, and studies are carefully assessing potential confounders such as sleep deprivation, age, stress, and attention deficit hyperactivity disorder.

Similar to our approach to concussive injuries, Army Medicine harvested research findings to inform the identification and treatment of combat stress and PTSD.

The ongoing examination of in-theater behavioral health issues led to fundamental changes in behavioral health care delivery, and provided valuable information to senior military leaders. The Mental Health Advisory Team (MHAT) is an Army supported mental health advisory team that deployed to Iraq and Afghanistan to assess the behavioral health of deployed service members, the quality of and access to BH care, and to recommend changes to improve the BH and BH services to our deployed service members. To date, eleven MHATs have been conducted in Iraq and Afghanistan since the beginning of OIF1.

Results from MHATs have led to numerous evidence-based recommendations that have impacted policy (e.g. dwell-time and deployment length), improved distribution of

mental health resources and services throughout theater, impacted the number of mental health personnel in theater, and modified the doctrine of the Combat and Operational Stress Control (COSC). WRAIR researchers also conducted systematic validation research (randomized trials) of post-deployment training modules that led to Army-wide implementation of Battlemind Training (now part of Comprehensive Soldier Fitness Resilience Training) across the deployment cycle.

A recently completed trial of the medication Prazosin for nightmares associated with combat-related PTSD in active duty Soldiers returned from Iraq and Afghanistan, supports the recently revised DoD/VA Clinical Practice Guideline (CPG) that recommends adjunctive treatment with Prazosin for nightmares.

DHP supported research also contributed to the new PTSD definition in the upcoming 5th edition of the American Psychiatric Association's Diagnostic and Statistic Manual of Mental Disorders (DSM-V).

Research has informed the development of new CPGs, to include the VA/DoD PTSD CPGs. Research results are being evaluated by the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE) and other agencies for promulgation across the Department of Defense and Veterans Affairs. Within the next one to two years, the DoD expects to have further research supporting specific prevention and treatment interventions for PTSD and suicide. In particular, studies underway are focused on delivering PTSD treatment in an accelerated timeline so that the time it takes to complete treatment is reduced from 10-12 weeks to two weeks.

The true "costs" of mental health issues are the loss of productivity, decreased quality of life, and the strain on professional and personal relationships. Increasing resiliency decreases this cost burden. Some of the research is focused on optimizing currently existing PTSD treatments to increase efficiency and accessibility; investigators are examining the use of virtual reality technology to enhance therapy effectiveness. This PTSD treatment research is being done by numerous investigators at government organizations (e.g., VA Medical Centers, Uniformed Services University of the Health

Sciences), as well as in collaboration with leading academic centers, and private industry both nationally and internationally.

While we have made significant gains in the treatment and management of BH diagnoses such as PTSD, we still face challenges. Non-visible injuries continue to carry a stigma, especially among young Soldiers. The key to eliminating the stigma of seeking care for BH issues is engaged, involved leadership at every level. We have embedded behavioral health personnel within operational units across the Army to facilitate all of our efforts to reduce stigma and improve assessment and treatment.

The Embedded Behavioral Health program is a multidisciplinary behavioral health care model that provides community behavioral healthcare to Soldiers in close proximity to their units and in coordination with their unit leaders. Utilization of this model has demonstrated statistically significant reductions in: (1) inpatient behavioral health admissions; (2) off-post referrals; (3) high risk behaviors; and (4) number of non-deployable Soldiers for behavioral health reasons. Leaders have a single trusted behavioral health point of contact and subject matter expert for questions regarding the behavioral health of their Soldiers. Embedded team members know the unit and are known by the unit, knocking down access barriers and stigma commonly associated with behavioral healthcare in the military setting. Currently, 26 Brigade Combat Teams and 8 other Brigade Sized Units are supported by Embedded Behavioral Health Teams. Expansion of Embedded Behavioral Health teams to all operational units is anticipated no later than FY16.

Army Medicine has developed the Behavioral Health Data Portal (BHDP), a web based application, to track patient outcomes, patient satisfaction, and risk factors. The BHDP was rapidly deployed and trained at 31 Military Treatment Facilities by the end of last year. It provides improved patient tracking within behavioral health clinics, provides real-time information regarding Soldier's behavioral health readiness status, and enhances provider communication with Commanders to ensure optimal, coordinated behavioral health care. This portal will improve surveillance and our ability to assess program and treatment efficacy.

Suicide Research

Last year the Army lost 183 Soldiers to suicide. These tragic losses affect all those left behind, including fellow Soldiers, families, and communities. The strain on our people after years of persistent conflict has also manifested itself through high-risk behaviors, including acts of violence, excessive use of alcohol, drug abuse and reckless driving. Our mission extends far beyond suicide prevention, and we are actively involved in ensuring the highest quality care for Soldiers and their Families – 365 days a year.

In June 2013, the Army will enter its fifth year of the Army Study to Assess Risk and Resilience in Service members (Army STARRS) partnership with the National Institute of Mental Health (NIMH). This study represents the largest study of mental health, psychological resilience, suicide risk, suicide-related behaviors, and suicide deaths in military personnel ever conducted. The goal is to identify factors that put a Soldier at risk for suicide, and factors that provide resilience, at specific points of Army service and over time. This information will then be used to develop evidence-based, targeted intervention strategies to decrease the frequency of suicides in the Army.

During the initial years of Army STARRS, researchers analyzed information from nearly 40 Army and Department of Defense datasets, spanning more than a billion data points, on all 1.6 million Soldiers who served on active duty from 2004-2009. In addition, the team is collecting data from volunteer Soldiers from every component of the Force (Active Army and those Army National Guard and Army Reserve Soldiers on active duty) who are in all phases of Army Service (Soldiers in initial entry training, Soldiers before and after deployment, Soldiers in theater, and Soldiers assigned to installations worldwide). Extensive information is collected through surveys and psychological evaluations, blood samples, and through Army and DoD administrative records.

To date approximately 112,000 Soldiers have voluntarily participated in Army STARRS and approximately 52,000 have given blood samples. Researchers will analyze these samples to look at biological risk associated with a history of mental

illness and these samples could be used as a baseline for future studies. The size of these cohorts is unprecedented in military research; this grand scale will help our understanding of suicide risk and protective factors and the development of mental health disorders. The data will complement other survey and neurocognitive data to give researchers a more complete understanding of risk and resilience. Preliminary findings include analyses in the areas of deployments, enlistment waivers, unit combat deaths, unit suicides, marriage, private housing, age and education, rank, years of service, military occupational specialties, exposure to traumatic events, head/neck/blast injury, prescription drug abuse, mental health disorders and treatment, and suicide attempts. Researchers are using these findings to develop tools to help identify subsets of Soldiers who may be at elevated risk for suicidal behaviors. Army STARRS is currently working with the Army on analogous approaches to targeting prevention and treatment interventions for Soldiers with particularly elevated suicide risk.

In addition to Army STARRS, MRMC established the Military Suicide Research Consortium involving partnerships with leading suicide researchers that is focused on specific interventions to reduce suicides. Examples include the development and validation of a suicide assessment tool, validation of a brief cognitive behavioral therapy intervention, enhancement of follow-up care through smartphone apps or text messaging, and packaging of medications in blister packs rather than pill bottles.

Accelerating Progress through Collaboration

The Army is proud to contribute to the efforts of the Departments of Defense, Veterans Affairs, Health and Human Services, and Education, to develop the National Research Action Plan (NRAP) in response to the White House Executive Order released on August 31, 2012 on “Improving Access to Mental Health Services for Veterans, Service Members, and Military Families.” Without question, improved data sharing between agencies, academic and industry researchers will accelerate progress and reduce redundant efforts without compromising privacy. Making better use of electronic health records will allow us to gain insight into the risk and mitigation of PTSD, TBI, and related injuries.

The DHP Research, Development, Test and Evaluation (RDTE) program has always involved DoD and VA collaboration. DoD currently provides a substantial portion of the research funding, from all sources, that supports VA scientists. In the past year, DoD provided more than \$30.5 million to VA researchers for 351 projects. DoD currently funds VA scientists to investigate several high-priority topics, including: PTSD, alcohol abuse, resilience to mitigate combat stress and post-deployment reintegration problems, mental health of female Veterans (including military sexual assault), treatment of TBI and spinal cord injuries, treatment for amputations and improved prosthetics, visual and hearing impairments, rehabilitation, telemedicine, and illnesses in Veterans of the 1990-91 Gulf War and Veterans of OIF and OEF. VA scientists frequently partner with DoD scientists, who serve in a supporting role as co-investigators. Approximately 80% of the DHP RDTE research efforts underway have VA involvement through investigator participation.

More recently, the DoD and VA have been collaborating through large consortia and joint leveraging of infrastructure and resources. There are several large DoD funded consortia to address PTSD, suicide, and associated issues. In 2012, the DoD and VA partnered to synergistically fund and manage two large joint consortia focused on developing biomarkers for preventing, detecting, and more effectively treating PTSD, TBI and its chronic effects as well as associated co-occurring issues.

Preventing, detecting, and treating brain injuries is not only a military concern but also affects millions of families across the country to include those involved in competitive sports. Leveraging mutual interests with our key partners and stakeholders will advance efforts for military and civilian communities. In March 2013, the National Football League, General Electric, and Under Armour launched an unprecedented \$60M research and innovation effort to accelerate brain injury detection and prevention. These corporations recognize the Army's subject matter expertise and will include them on medical advisory panels that will help guide clinical research efforts to ensure research efforts are not duplicated.

The Road Ahead

Military Medicine is at an important crossroad. We need to continue making deliberate, resource-informed decisions to ensure we meet the needs and challenges of today while preparing for tomorrow. We owe it to this generation of Soldiers and Families to help them deal with the consequence of war, long after the last Soldier departs Afghanistan. Our commitment to support Wounded Warriors and their Families must never waiver, and our programs of support must be built and sustained for the long road ahead - as the young Soldiers of today mature into our aging heroes of the future.

I'd like to leave you today with a story which illustrates the miracles which are possible from the investment in research and medical innovation.

Paul "Rob" Roberts joined the Army in 2003. On June 2, 2009, during his deployment to Afghanistan, his unit was performing a routine combat patrol when his vehicle was hit with an improvised explosive device (IED). The impact of the IED destroyed the vehicle and killed the driver, gunner, and interpreter. Staff Sergeant Roberts was the only survivor.

He sustained severe injuries from the explosion including third degree burns to his wrists and legs, second degree burns to his arms and face, and traumatic brain injury. He was evacuated to Bagram Air Force Base, and then eventually moved to the Army burn center in San Antonio, Texas.

Due to the tremendous research investments made in combat trauma, psychological health, and TBI, SSG Roberts recovered from both his visible and invisible wounds. He was medically retired and successfully transitioned from military to civilian life. Following retirement, SSG(R) Roberts chose to continue his service to our Nation by assuming a position at the Federal Bureau of Investigation. His survival from his horrific injuries and ability to transition to civilian life is a direct result of the fruit borne by years of medical research.

In closing, a strong, decisive Army will be -- as it always has been -- the strength of our Nation. Behavioral Healthcare and resiliency are important factors in the readiness

of the Army. I am proud of Army Medicine's capable and compassionate team, evidence based practices and far-reaching programs which are key pillars of our commitment to a ready and resilient Army family.

In partnership with the Department of Defense, my colleagues on the panel today, the Department of Veterans Affairs, our civilian partners and the Congress, we will be prepared for tomorrow's challenges. Thank you again for the opportunity to testify before the committee and for your steadfast support to our Soldiers, Civilians, Families and Veterans. The Army Medicine team is serving to heal - and truly honored to serve them.