

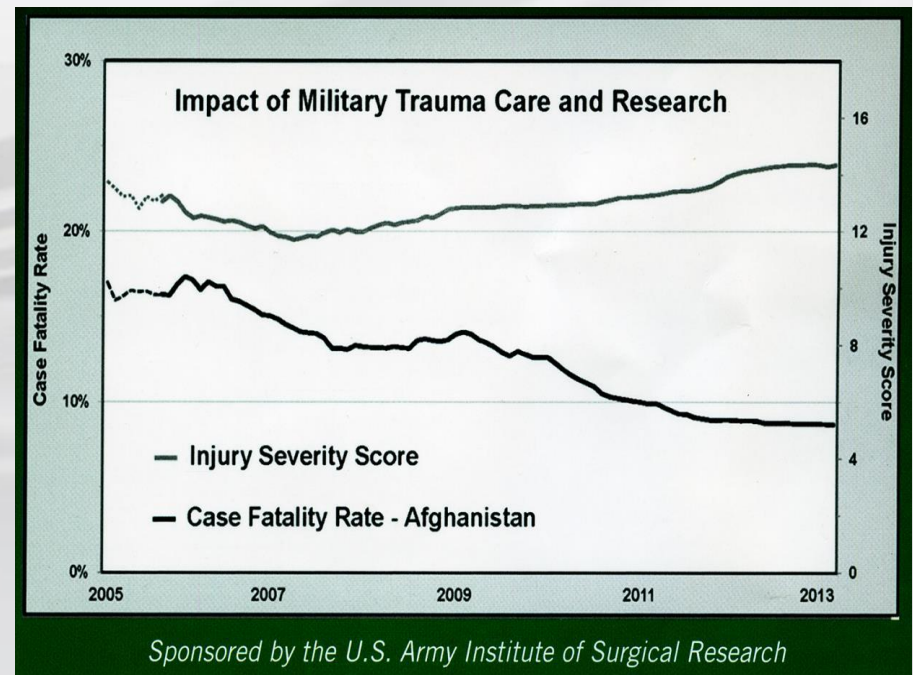
# Military Medicine in a Complex Environment

## The Defense Health Program Research Overview

**Dr. Terry M. Rauch**

Director, Research & Development Policy & Oversight  
Office of the Assistant Secretary of Defense for Health Affairs

April 19, 2016



**“Medically Ready Force . . . . Ready Medical Force”**

# Military Health System Strategy

## *Research to provide for . . .*

### **Increased Readiness**

Ensuring that the total military force is medically ready to deploy and that the medical force is ready to deliver health care anytime, anywhere in support of the full range of military operations, including humanitarian missions.

### **Better Care**

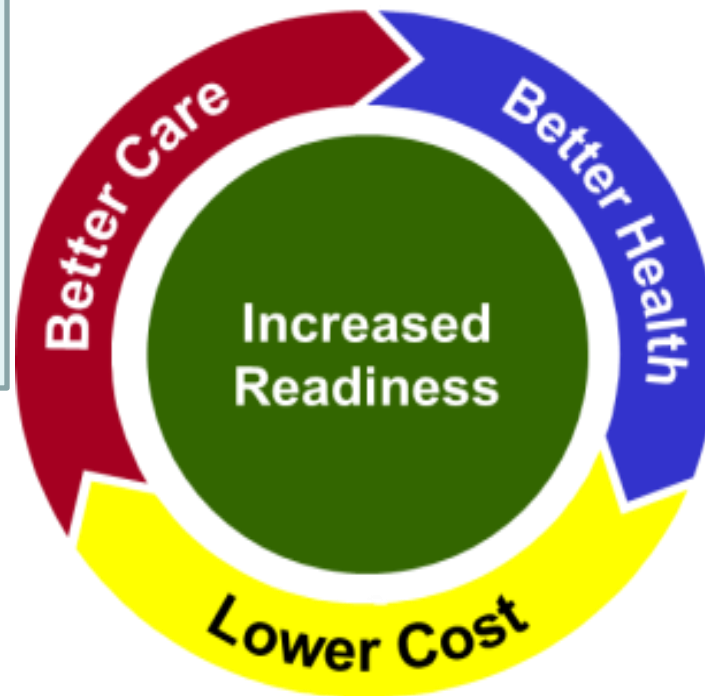
Providing a care experience that is patient and family centered, compassionate, convenient, equitable, safe and always of the highest quality.

### **Better Health**

Reducing the generators of ill health by encouraging healthy behaviors and decreasing the likelihood of illness through focused prevention and the development of increased resilience.

### **Lower Cost**

Creating value by focusing on quality, eliminating waste, and reducing unwarranted variation; considering the total cost of care over time, not just the cost of an individual health care activity.



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**“Medically Ready Force . . . . Ready Medical Force”**

# Strategic Drivers of Research

## Executive Requirements



### National Research Action Plan

Responding to the Executive Order  
Improving Access to Mental Health  
Services for Veterans, Service Members,  
and Military Families (August 31, 2012)

Department of Defense  
Department of Veterans Affairs  
Department of Health and Human Services  
Department of Education

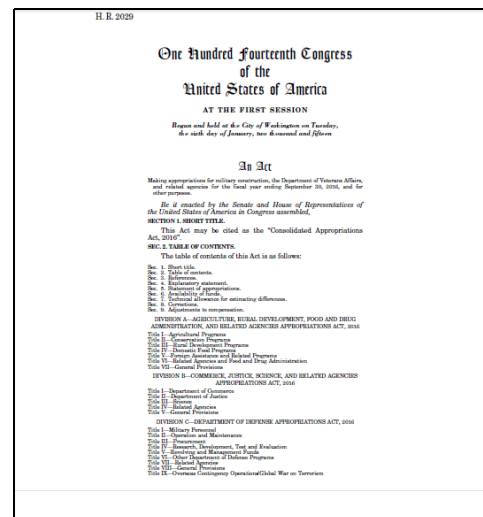
August 2013



## Legislative Requirements



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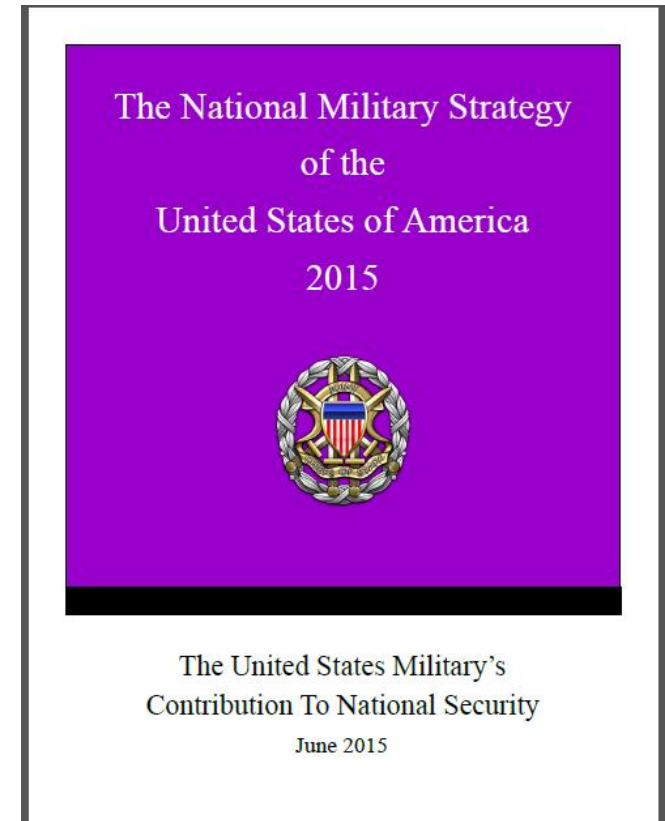


# Strategic Drivers of Research

***Today's global security environment is the most unpredictable I have seen in 40 years of service.*** Since the last National Military Strategy was published in 2011, global disorder has significantly increased while some of our comparative military advantage has begun to erode. We now face multiple, simultaneous security challenges from traditional state actors and transregional networks of sub-state groups – all taking advantage of rapid technological change. ***Future conflicts will come more rapidly, last longer, and take place on a much more technically challenging battlefield.***

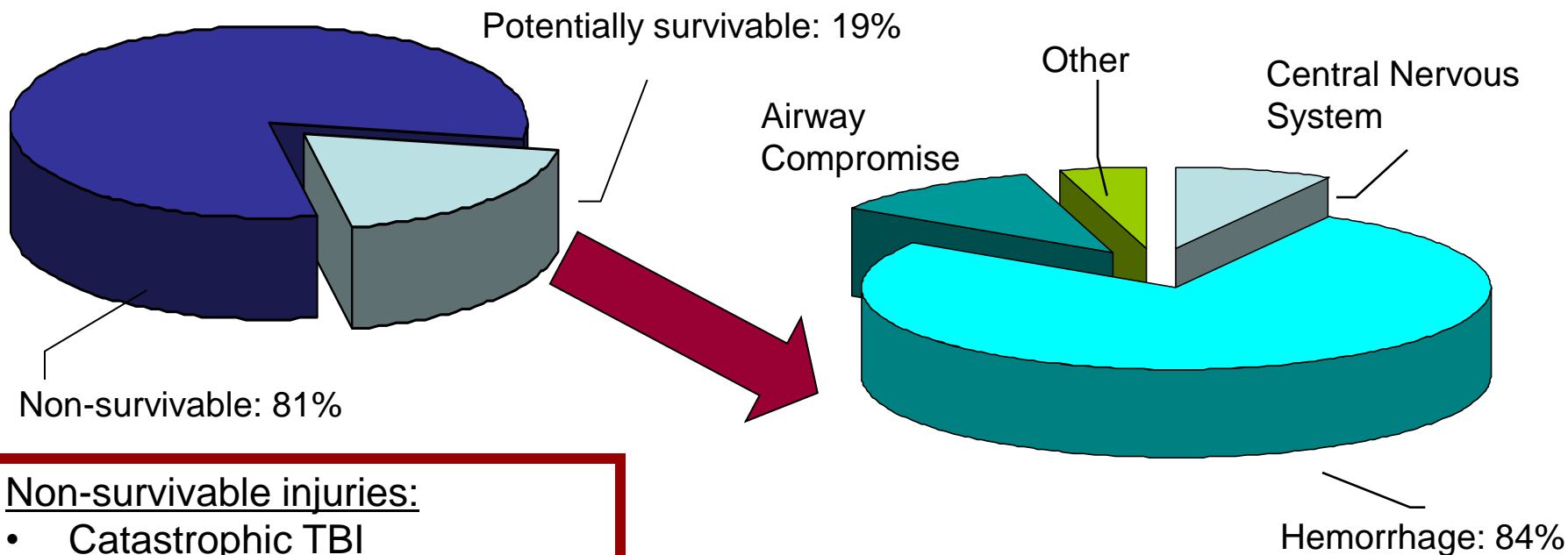
Chairman's Foreword

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# Strategic Drivers of Research

## All Deaths



### Non-survivable injuries:

- Catastrophic TBI
- Cardiac laceration / puncture
- Thoracic great vessel injury
- Intra thoracic tracheal injury
- Open pelvis

### Top cause of preventable DOW\*:

- Hemorrhage 76%
- Burn 13%
- TBI 6%
- MOF 3%
- Airway 1%

\*DOW: Died of Wounds at Role 3+

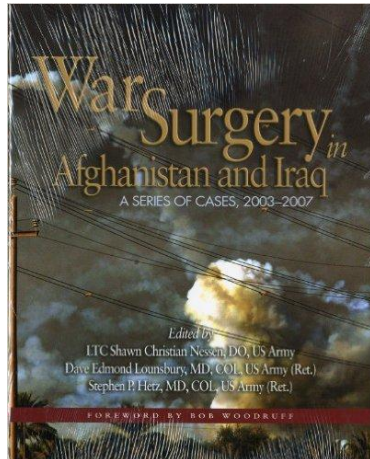
33% Tourniquetable  
 67% *Non-compressible/  
 non-tourniquetable  
 (internal injuries)*



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# Strategic Drivers of Research: Lessons Learned



SPECIAL REPORT

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## Implementing and preserving the advances in combat casualty care from Iraq and Afghanistan throughout the US Military

Frank K. Butler, MD, David J. Smith, MD, and Richard H. Carmona, MD, San Antonio, Texas

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**ABSTRACT:** Thirteen years of continuous combat operations have enabled the US Military and its coalition partners to make a number of major advances in casualty care. The coalition nations have developed a superb combat trauma system and achieved unprecedented casualty survival rates. There remains, however, a need to accelerate the translation of new battlefield trauma care information, training, and equipment to units and individuals deploying in support of combat operations. In addition, the US Military needs to ensure that these advances are retained during peace interludes and that we continue to build upon our successes as we prepare for future conflicts. This article contains recommendations designed to accomplish these goals. For the proposed actions to benefit all branches of our armed services, the direction will need to come from the Office of the Secretary of Defense in partnership with the Joint Staff. Effective translation of military advances in prehospital trauma care may also increase survival for law enforcement officers wounded in the line of duty and for civilian victims of Active Shooter or terrorist-related mass-casualty incidents. (*J Trauma Acute Care Surg* 2015;79:321-326. Copyright © 2015 Wolters Kluwer Health, Inc. All rights reserved.)

**KEY WORDS:** Tactical Combat Casualty Care; Joint Trauma System; battlefield trauma care; combat casualty care; clinical practice guidelines.

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**Combat Casualty Care, 2001**

The US Military had not effectively sustained many of the lessons learned from past conflicts and went to war in Afghanistan without wide availability of tourniquets, without modern battlefield analgesics, without prehospital plasma, and without trauma care guidelines designed specifically for use on the battlefield. Hemostatic dressings had not yet been developed in the field. There was no military deployed trauma system, no Department of Defense trauma registry (DoDTR), no weekly worldwide trauma teleconferences to review treatments and outcomes for all casualties occurring in the preceding week, and no Committee on Tactical Combat Casualty Care (CoTCCC).<sup>9-12</sup>

**Combat Casualty Care, 2015**

All of these challenges were met during the 13 years of combat that followed the attacks of September 11, 2001. This longest interval of continuous combat operations allowed the US Military and its coalition partners to make major advances in trauma care and to achieve unprecedented casualty survival rates.<sup>13</sup> The standards of care have been redefined in surgical hemorrhage control, transfusion medicine, and care of casualty transport.<sup>14</sup> The United States and its coalition partners have now developed a Joint Trauma System (JTS) that works closely with the combat theater medical support to establish and ensure standards for battlefield, austere, and in-hospital trauma care.<sup>15</sup> Forty-five evidence-based clinical practice guidelines (CPGs) are presently used on evacuation platforms and in our deployed military hospitals to reserve trauma care lessons learned.<sup>16</sup> Some of these advances have transitioned rapidly to the civilian sector. The Army's damage-control resuscitation strategy, for example, is designed to promote hemostasis as well as to restore vascular volume and tissue perfusion in casualties being evacuated from hemorrhagic shock;<sup>17</sup> has been shown to

**In the 'GOLDEN HOUR'**

Combat Casualty Care Research drives innovation to improve survivability and reimagine future combat care

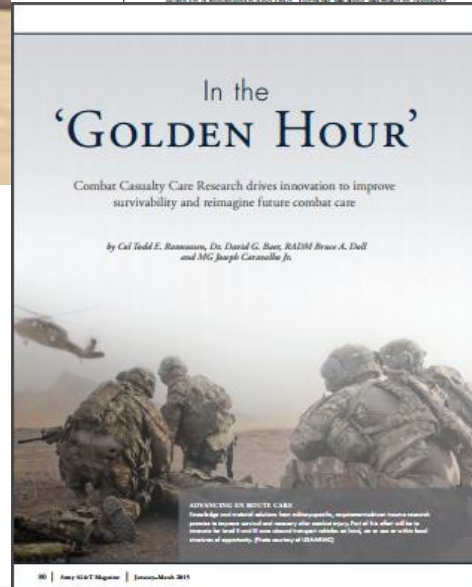
by Col Todd E. Rasmussen, DA, David G. Rice, RADM Bruce A. Dell and MG Joseph Caranalle Jr.

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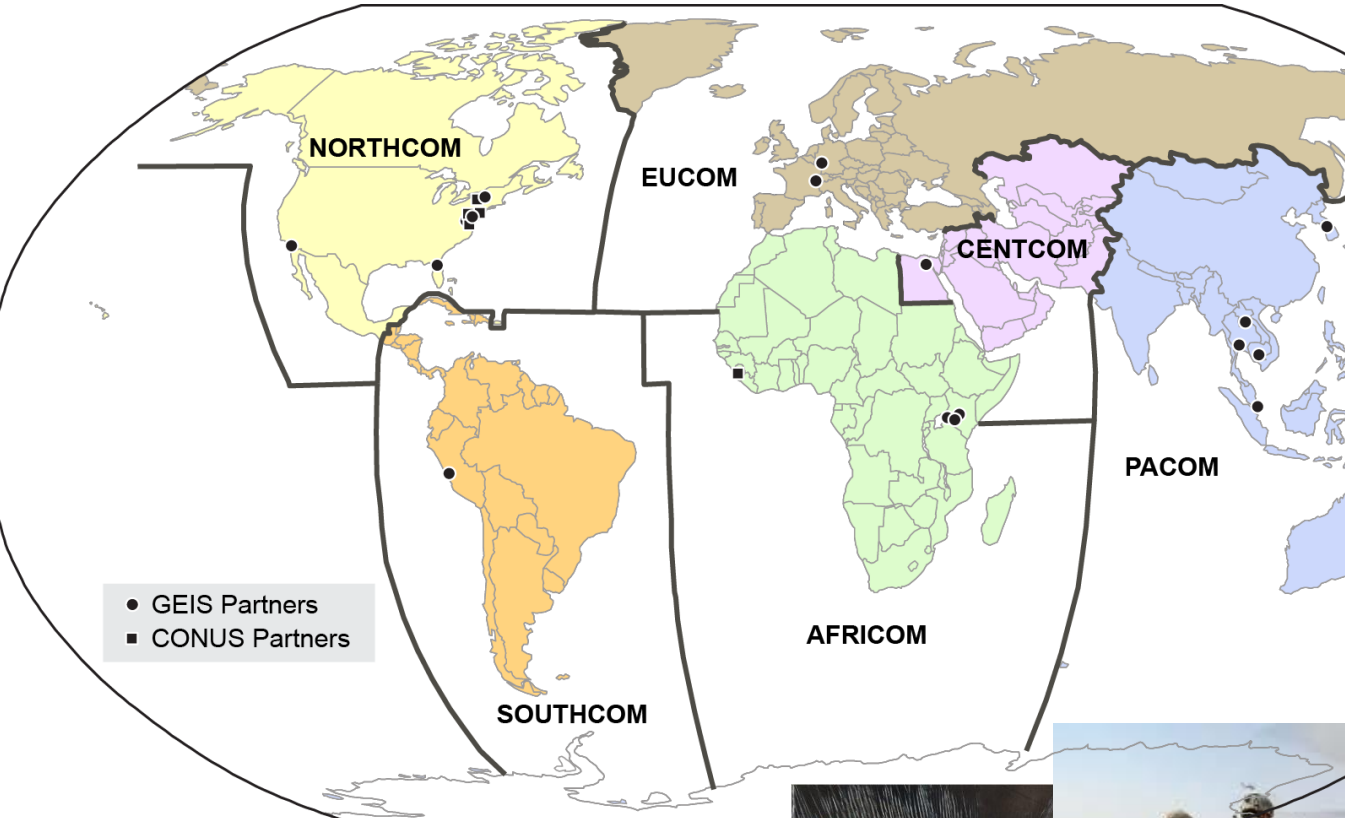
# Complex Environment The Times They Are A-changin'



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# Translation to Future Capabilities



SPECIAL REPORT

## Implementing and preserving the advances in combat casualty care from Iraq and Afghanistan throughout the US Military

Frank K. Butler, MD, David J. Smith, MD, and Richard H. Carmona, MD, San Antonio, Texas

**ABSTRACT:** Thirteen years of continuous combat operations have enabled the US Military and its coalition partners to make a number of major advances in combat casualty care. The coalition forces have developed a robust combat trauma system and achieved unprecedented casualty survival rates. These advances, however, are not self-sustaining. There remains a need to accelerate the translation of new battlefield trauma care information, training, and equipment to all US and coalition personnel in support of combat operations. To address the US Military needs to ensure that these advances are maintained during peace intervals and that we continue to build upon our successes as we prepare for future conflicts. This special report provides recommendations for how to accomplish these goals. For the prepared services to benefit from the best practices of our armed services, the attention will need to come from the Office of the Secretary of Defense in partnership with the Joint Staff. Effortless translation of military trauma care into the civilian sector is a top priority. The US Military must ensure that the civilian sector is kept up to date and that the civilian sector is able to receive the best of our military trauma care. (J Trauma Acute Care Surg 2013; 74: 101-105, Copyright © 2013 Wolters Kluwer Health | All rights reserved)

**KEY WORDS:** Special Operations, Trauma, US Military, Battlefield Trauma, Combat Casualty Care, Battlefield Trauma Care

**Combat Casualty Care, 2001**

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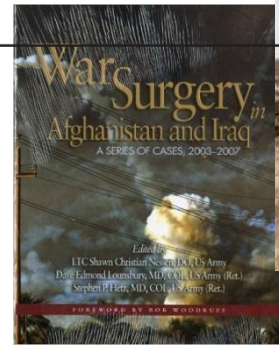
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## In the 'GOLDEN HOUR'

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by Col Todd E. Romkowski, Dr David G. Ryan, BAISM Bruce A. Dhill and Maj Joseph Caronville Jr.



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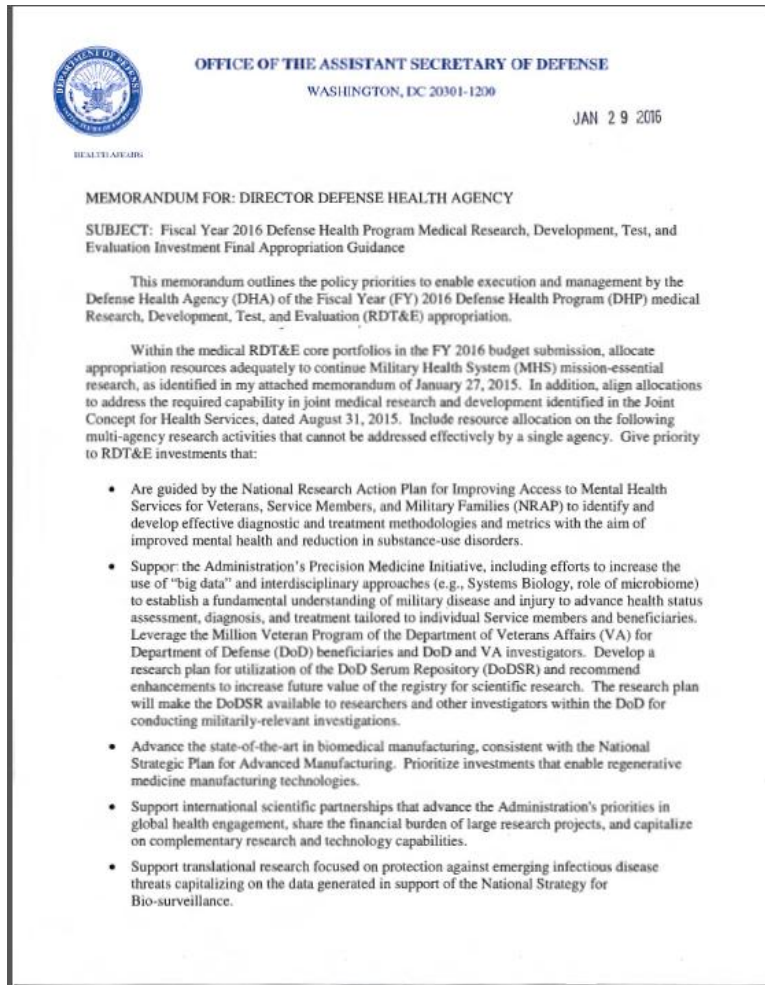


# Services Submit Plans on Integrating Women Into All Military Jobs

WASHINGTON, January 5, 2016 — The Defense Department has received plans from each of the services for implementing plans to integrate women into all positions in the military,



# Investment Strategy



- Allocate resources to continue MHS mission-essential research
- Give priority to:
  - National Research Action Plan
  - President's Precision Medicine Initiative
  - Utilization of the DoD Serum Repository
  - Biomedical manufacturing
  - International scientific partnerships that advance priorities in global health engagement
  - Health services research that strengthens scientific basis for decision-making in patient safety and quality performance in the MHS
  - Improve deployment military occupational and environmental exposure monitoring
  - Ensure Congressional Special Interest items support core MHS mission-essential portfolios, to the fullest extent possible.
- Convene inter-agency portfolio R&As to assess portfolio performance.



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# The Focus of Military Medical Research



Prevent

Stabilize/Preserve

Repair

Resolve



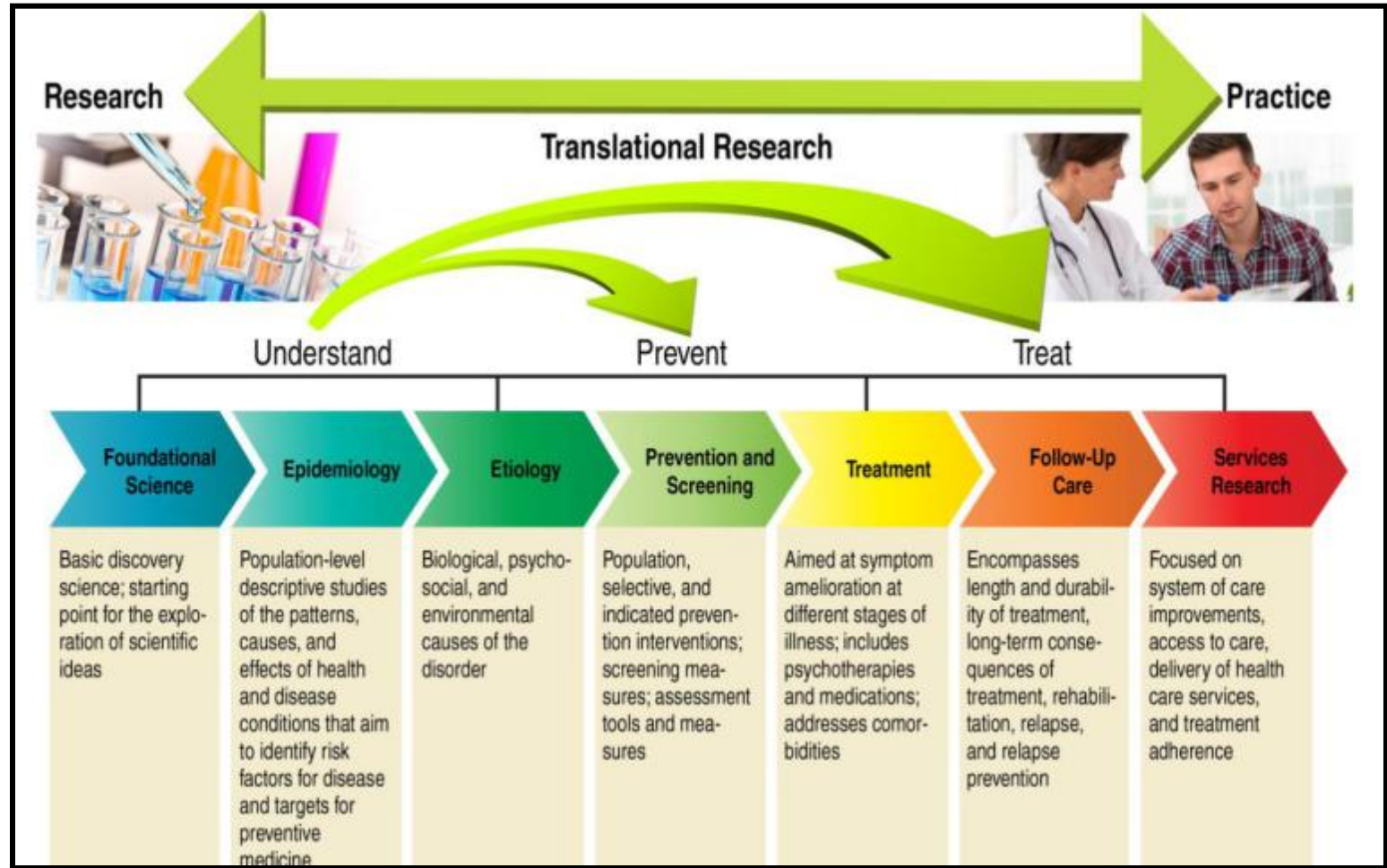
**MILITARY HEALTH SYSTEM (MHS)**  
“Medically Ready Force...Ready Medical Force”

*DoD Image*





# How Research Plans are Organized



# Execution & Management Joint Program Committees Portfolio Focus

Each of the six DHP core research program areas is strategically guided by a committee, called a Joint Program Committee, or JPC, which consists of Department of Defense (DoD) and non-DoD medical and military technical experts. These experts work through coordinated efforts to translate guidance into research and development needs. They also have key responsibilities for making funding recommendations and providing program management support.

- JPC-1: Medical Simulation & Information Sciences
- JPC-2: Military Infectious Diseases
- JPC-5: Military Operational Medicine
- JPC-6: Combat Casualty Care
- JPC-7: Radiation Health Effects
- JPC-8: Clinical & Rehabilitative Medicine



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# Summary of Major Investments

## Clinical & Rehabilitation Medicine



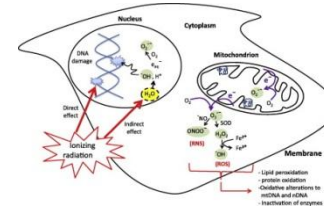
Regenerative Medicine  
 Neuromusculoskeletal Injury  
 Pain Management  
 Sensory System Injury  
 Rehabilitation Medicine  
 Clinical Medicine  
 Wound Management

## Military Operational Medicine



Mild Traumatic Brain Injury  
 Injury Prevention & Reduction  
 Psychological Health & Resilience  
 PTSD & Suicide  
 Physiological Health  
 Environmental Health & Protection

## Radiation Health Effects



Diagnostic Biodosimetry  
 Countermeasures  
 - Protection  
 - Treatment

## Medical Training & Health Information Sciences



Mobile Health Applications  
 Med-Surgical Simulation  
 Technologies  
 Live tissue replacement  
 Skills Retention/Transference  
 Re-entry

## Infectious Diseases



Wound Infection  
 - Prevention  
 - Management  
 - Treatment  
 Pathogen Detection  
 HIV Prevention  
 H1N1 Diagnostics

## Combat Casualty Care



Moderate/Severe/Penetrating TBI  
 Hemorrhage Control, Resuscitation &  
 Blood Products  
 Extremity Trauma, Tissue Injury,  
 Craniomaxillofacial Injury, lung injury,  
 & Burns  
 EnRoute Care  
 Health Monitoring &  
 Diagnostic Technology

## Global Health Engagement





# A Few Highlights of Program Emphasis



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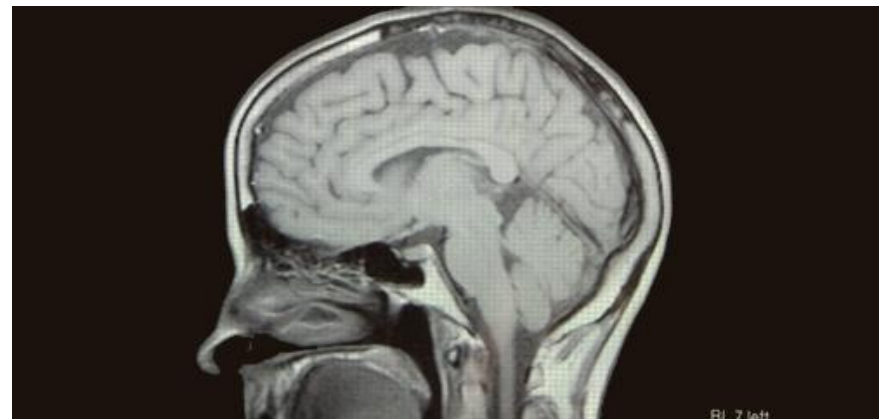
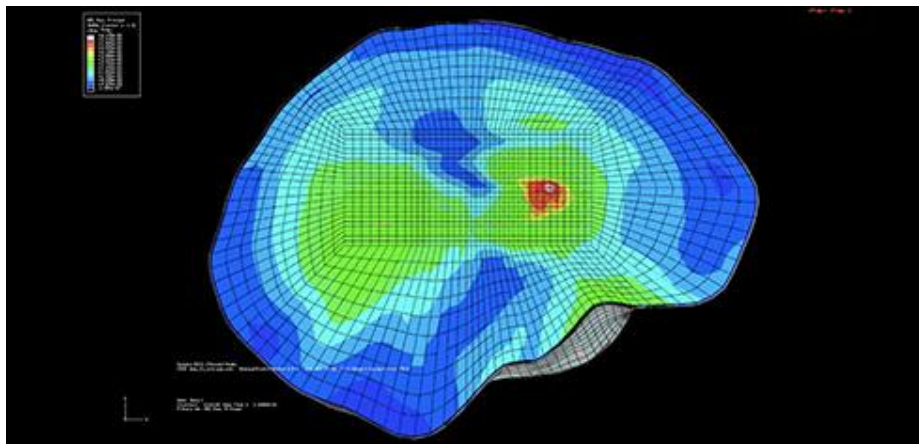


# The President's Precision Medicine Initiative

*To enable a new era of medicine through research, technology, and policies that empower patients, researchers, and providers to work together toward development of individualized care.*



# NCAA-DoD Grand Alliance: Concussion Assessment Research Education (CARE) Consortium







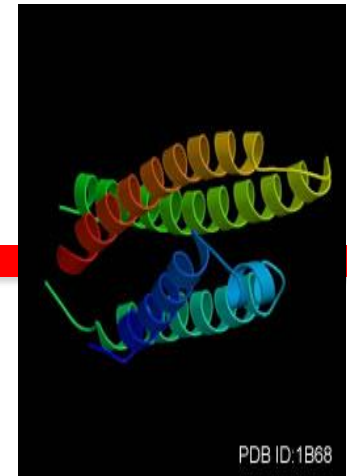
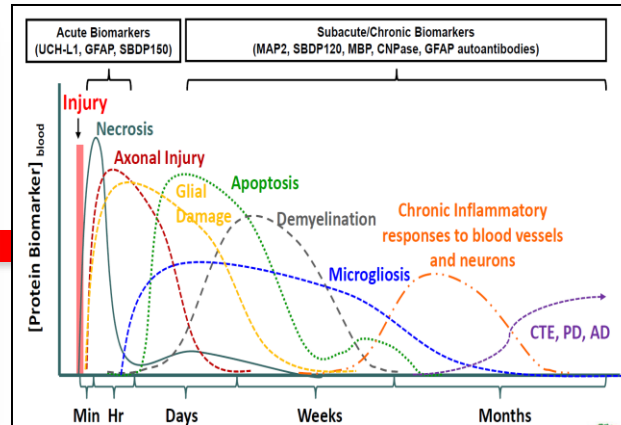
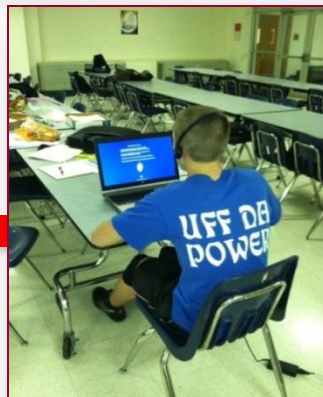
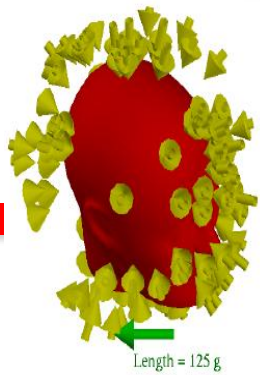
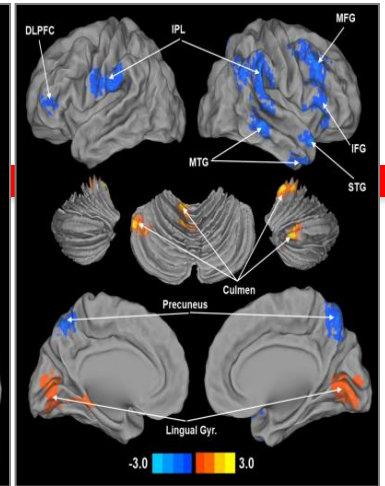
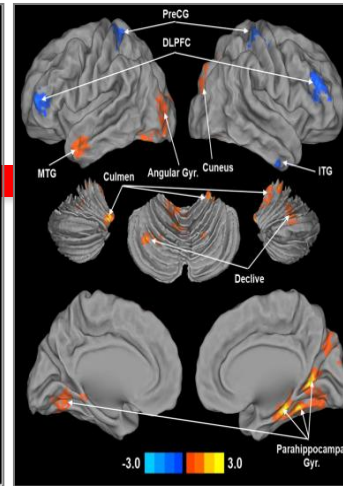
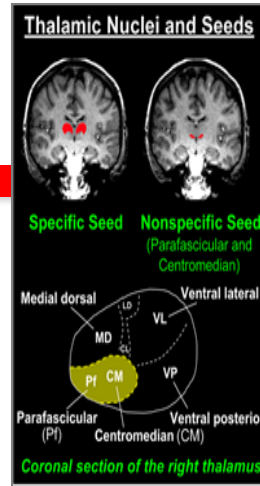
# President Obama Applauds Commitments to Address Sports-Related Concussions in Young People

- President Obama, May 29, 2014, “The **NCAA and the Department of Defense are teaming up to commit \$30 million for concussion education and a study** involving up to 37,000 college athletes, which will be the most comprehensive concussion study ever. And our service academies -- **Army, Navy, Air Force, and Coast Guard -- are all signed up to support this study** in any way that they can.”



# CARE Consortium:

## Multidimensional Study of Injury & Recovery



Understanding the Natural History of Clinical & Neurobiological Recovery

# NCAA CONCUSSION STUDY: BY THE NUMBERS

In May 2014, the NCAA and U.S. Department of Defense launched a landmark initiative to enhance the safety of athletes and service members. This included the most comprehensive study of concussion ever conducted. The research is managed by the Concussion Assessment, Research and Education (CARE) Consortium, with 21 participating universities enrolling all male and female student-athletes in the study.

Additionally, the Mind Matters Challenge called for education and research submissions from academic institutions and the private sector to help change the culture of concussion reporting and management.



**\$30 MILLION**  
NCAA-Department of Defense Grand Alliance

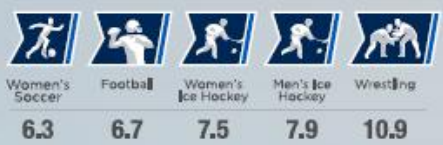
## ENROLLMENT DATA

More than **16,000** student-athletes currently enrolled

**37,000** student-athletes estimated to participate by end of three-year study

## THE HARDEST HITS

The annual national estimate of reported concussion rates in NCAA sports during the 2009-10 to 2013-14 academic years.



*Rates per 10,000 athletic exposures  
\*Source: Datalyis, a firm that tracks NCAA injury data*

## CONCUSSION FIGURES

College athletes suffered an average of **10,500** concussions for the past five years, of which approximately **3,400** occurred in football; American service members have suffered more than **320,000** brain injuries since 2000, and more than 80 percent have occurred outside of combat. It's estimated that between **1.6 million** and **3.8 million** recreation-related concussions occur annually nationwide.

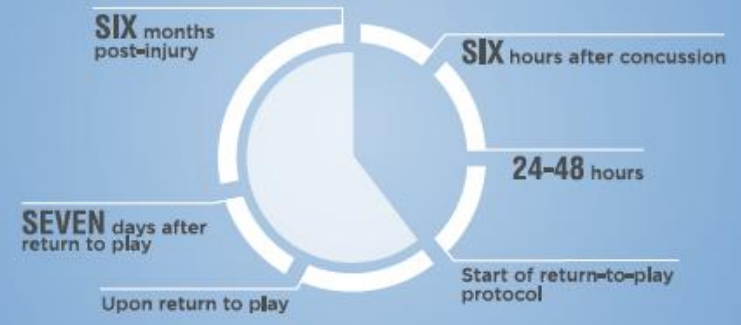
## CONCUSSION DATA

Nearly **500** concussions studied to date. Previously, a large concussion study was considered to be **20** concussions. *Student-athletes from every sport are represented.*

**30 PERCENT**

of concussions studied are in females

Each student-athlete undergoes baseline testing before the season and then data are collected again at specific intervals after he or she suffers a concussion.



**Six Time Points: Baseline, Within 6hrs, Within 24-48hrs, Return to Play Progression (Practice), Unrestricted Return to Play, 6 Months Post-Concussion**

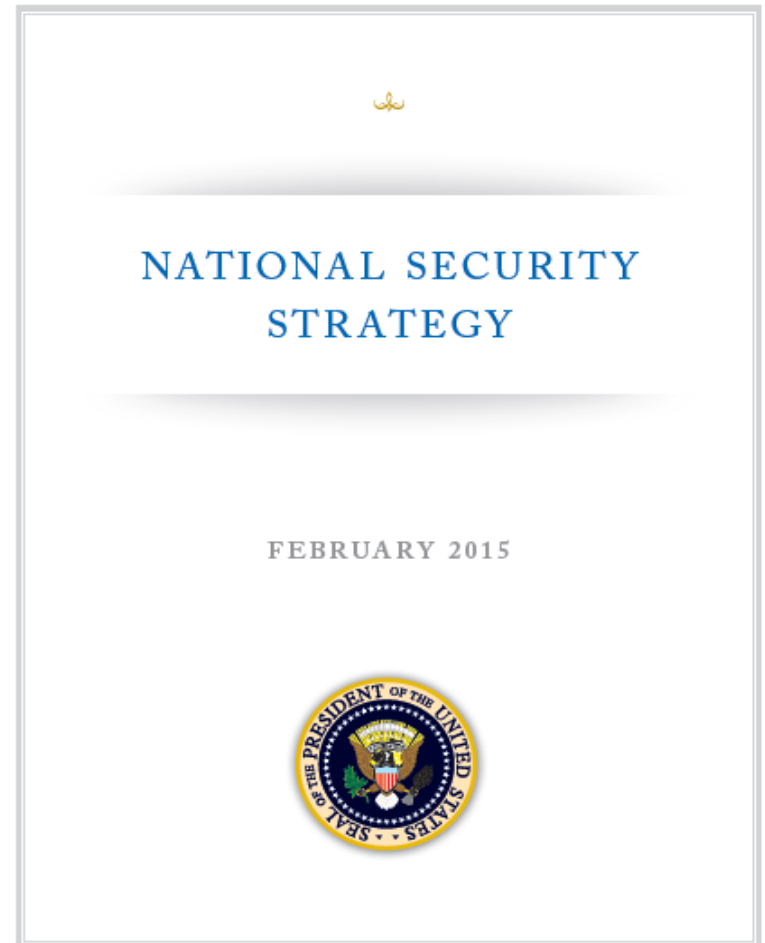




# DoD Global Health Engagement (GHE) Supporting the NSS

- We will advance the security of the United States, its citizens, and U.S. allies and partners by:
  - ▣ Developing a global capacity to prevent, detect, and rapidly respond to biological threats like Ebola through the Global Health Security Agenda.
  - ▣ Leading efforts to reduce extreme poverty, food insecurity, and preventable deaths with initiatives such as Feed the Future and the President's Emergency Plan for AIDS Relief.”

## *2015 National Security Strategy*





# GHE - Importance of International Collaboration



“Infectious disease does not respect international borders or government bureaucracies. Identifying and cultivating areas where our cooperation can be strengthened is something that all of us should be focused on.”

- *ASD(HA) Dr. Jonathan Woodson, Asia Pacific Military Health Exchange 2015, Hanoi, Vietnam*

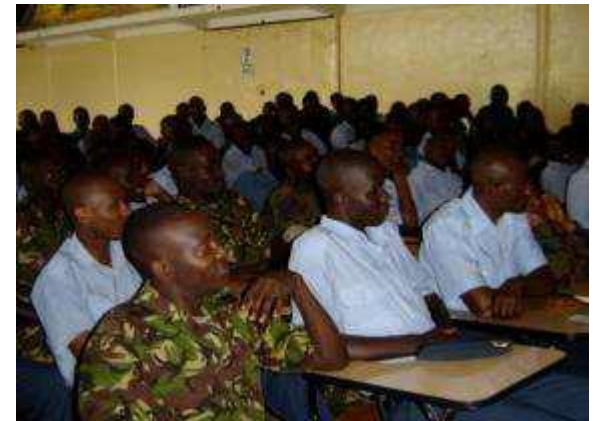


# GHE Investments

- Developing capability in West Africa to address health security.
  - Biosurveillance network in the region and strengthening systems for countermeasure development.



*DoD Image*







# GHE - Force Health Protection & Readiness

- Enhancing DoD vaccine production.
  - Pilot Bioproduction Facility is on track for a full renovation yielding a capability which can produce moderate lot production of vaccines to be used in first in human studies with additional capacity to meet small lot production needs.





# GHE - Infectious Disease Research

US Military HIV Research Program led first HIV vaccine to show efficacy

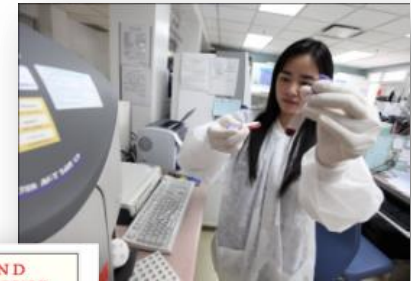
- RV144 was international collaboration involving NIH, Thai government, and private industry
- 16,000 Thai volunteers
- Showed a preventive vaccine IS possible

Developing & improving detection capabilities

MERS-CoV vaccine candidate in Phase 1 Clinical Trials at WRAIR

Advancing three Ebola vaccine candidates

- MHRP sites in Africa leveraged for Ebola vaccine research
- Conducted first Ebola vaccine study in Africa
- Ongoing trials in Uganda and Nigeria
- US trial of VSV-EBOV candidate at Walter Reed Army Institute of Research (WRAIR) entered phase 2 clinical trials January 2016



**Key capabilities for responding to next infectious diseases crisis**

# Some Things to Think About



MILITARY HEALTH SYSTEM (MHS)



# Battlefield Care “Big Problems”

## Mortality

- Non-compressible Hemorrhage
  - Coagulopathy
- Compressible Hemorrhage
  - Extremity
  - Ax/neck/groin
- Pneumothorax
- Airway Compromise
- Central Nervous System
- Deep Vein Thrombosis
- Multisystem Organ Failure
- Sepsis

## Training

- Medic
- Specialty Surgeon
- Other Providers

## Morbidity and Co-Morbidity

- Traumatic Brain Injury
  - Mild to Severe
- Massive Soft Tissue Injury
- Orthopedic Trauma
- Burn
- Eye Trauma
- Ear Trauma
- Craniofacial Injury
- Pain Control
- Lung Injury
- Wound Infection

## Psychological Health

- PTSD
- Suicides



# Restoration & Rehabilitation “Big Problems”

## Extremity

- Limb salvage
- Heterotopic ossification
- Amputation – multiple and late
- Upper extremity prosthetics

## Burns

- Skin coverage
- Scarring – aesthetic and functional

## Pain Management

- Chronic pain
- Opioid dependence
- Battlefield usage is limited by side effects
- Lack of clinical practice guidelines

## Cranio-maxillofacial

- Deformities
- Motor control
- Sensation
- Burns

## Sensory Systems

- Ocular trauma
- Loss of vision and hearing
- Tinnitus
- Balance disorders

## Traumatic Brain Injury

- Cognitive processing disorders
- Language and memory
- Sensory system dysfunction



# Military Operational Medicine “Big Problems”

## **Injury Prevention and Reduction**

- Blast overpressure
- Blunt and penetrating trauma
- Musculoskeletal & training injuries
- Neurosensory injury

## **Psychological Health & Resilience**

- PTSD/Other Anxiety Disorders
- Suicide Behavior
- Concussion (mTBI)
- Alcohol/Other Drug Use
- Co-occurring Mental Disorders
- Access/Retention in Behavioral Health Care
- Family Transitions and Well-being

## **Assess & Sustain Health & Performance in Extreme Environments**

- Extremes of heat/cold and hydration, high altitude, & toxic industrial chemicals & materials
- Monitoring, assessing & documenting exposures & experiences

## **Physiological Health**

- Malnutrition
- Dehydration
- Sustained Fatiguing Work (Physical/Mental)
- Sleep Deficit & Circadian Desynchrony
- Distributed/Continuous Operations
- Dietary Supplements





# Infectious Diseases “Big Problems”

## Prevention, Field Intervention & Long Term Treatment/Management

- Malaria
- Flaviviruses
- Diarrheal Pathogens
- Identification and Control of Vectors
- Wound Infections
- Rickettsia
- Emerging Infections
- Anti-microbial Resistance
- HIV
- Rapid Screening of Whole Blood
- Acute Respiratory Diseases
- Surveillance



# In Closing

- Academic and private sector partnership with DoD health has been critical to our successful performance over the past 14 years
- Threats are not going away; our research and development demands are essential to sustaining and improving health & performance
- Our need for collaborative partnerships is expanding, and we welcome it
- Continued reform of our administrative processes is essential
- Thank you for providing me this opportunity ...



# Questions



MILITARY HEALTH SYSTEM (MHS)