Military Medicine in a Complex Environment

The Defense Health Program Research Overview

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“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.

MILITARY HEALTH SYSTEM (MHS)

“Medically Ready Force . . . Ready Medical Force”
Strategic Drivers of Research

- Executive Requirements

- Legislative Requirements
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.
Strategic Drivers of Research

All Deaths

- Non-survivable: 81%
- Potentially survivable: 19%

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

Top cause of preventable DOW*:
- Hemorrhage 76%
- Burn 13%
- TBI 6%
- MOF 3%
- Airway 1%

*DOW: Died of Wounds at Role 3+

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

Central Nervous System
- Hemorrhage: 84%

33% Tourniquetable
67% Non-compressible/ non-tourniquetable (internal injuries)
Strategic Drivers of Research: Lessons Learned

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: There are case of combat casualty care have eradicated the US Military and its coalition partners the make of war. The advances in medical care and technology have allowed for the development of new treatments and procedures. The United States has developed new and improved methods to treat injuries sustained during combat. These advances have been implemented throughout the military and civilian healthcare systems. The US military has been at the forefront of medical research and development, and has been able to provide the best possible care to its service members. This has resulted in a significant decrease in mortality rates and an improvement in patient outcomes.

KEY WORDS: Combat Casualty Care, Iraq, Afghanistan, Military Medicine

In the ‘Golden Hour’

Combat Casualty Care: Research drives innovation to improve survivability and mitigate the effects of combat care

By Col. Mark A. Harbin, MD,evaluated by: Bev A. Smith, RN

The ‘Golden Hour’ refers to the first 60 minutes following a traumatic event. During this time, the most critical surgeries are performed, including resuscitative surgical procedures and trauma care. The goal is to quickly and effectively stabilize the patient and provide life-saving interventions. The effectiveness of this time frame is critical in determining the patient’s outcome. The US military has been at the forefront of this research, and has developed new and improved methods to treat injuries sustained during combat. This has resulted in a significant decrease in mortality rates and an improvement in patient outcomes.
Complex Environment
"The Times They Are A-changin'"
Translation to Future Capabilities

MILITARY HEALTH SYSTEM (MHS)
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.
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

Translational Research

Understand

Foundational Science
- Basic discovery science; starting point for the exploration of scientific ideas

Epidemiology
- Population-level descriptive studies of the patterns, causes, and effects of health and disease conditions that aim to identify risk factors for disease and targets for preventive medicine

Etiology
- Biological, psychosocial, and environmental causes of the disorder

Prevention and Screening
- Population, selective, and indicated prevention interventions; screening measures; assessment tools and measures

Prevent

Treatment
- Aimed at symptom amelioration at different stages of illness; includes psychotherapies and medications; addresses comorbidities

Treat

Follow-Up Care
- Encompasses length and durability of treatment, long-term consequences of treatment, rehabilitation, relapse, and relapse prevention

Services Research
- Focused on system of care improvements, access to care, delivery of health care services, and treatment adherence
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
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
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
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.”
“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.
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.
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
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

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

Training
- Medic
- Specialty Surgeon
- Other Providers

Psychological Health
- PTSD
- Suicides
Restoration & Rehabilitation “Big Problems”

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

**Cranio-maxillofacial**
- Deformities
- Motor control
- Sensation
- Burns

**Burns**
- Skin coverage
- Scarring – aesthetic and functional

**Sensory Systems**
- Ocular trauma
- Loss of vision and hearing
- Tinnitus
- Balance disorders

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

**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