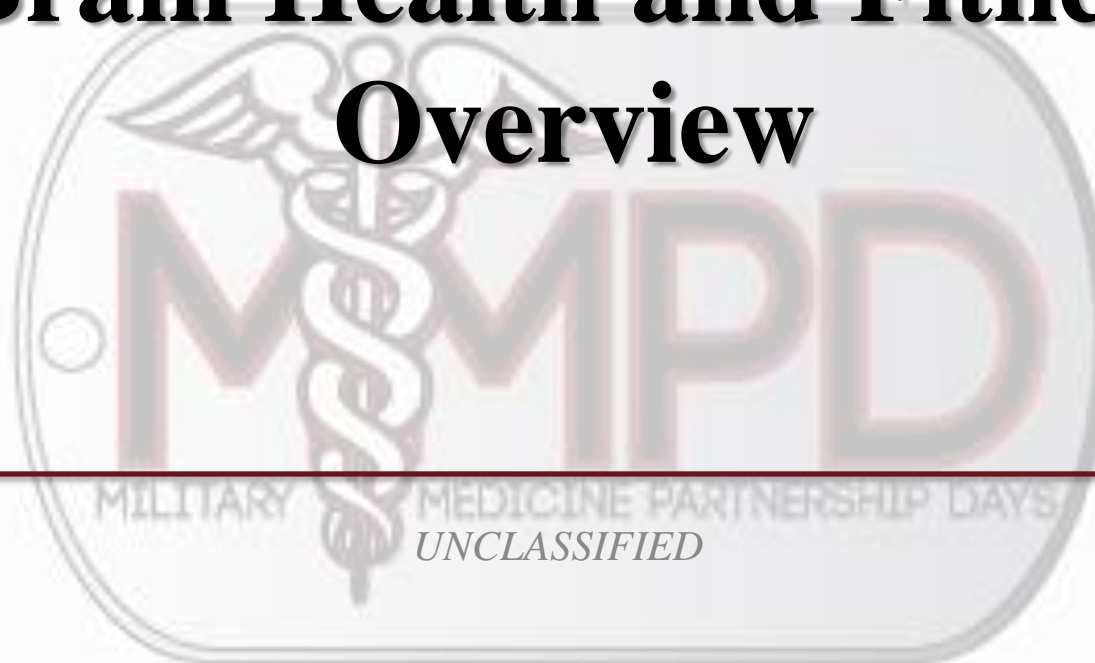




Brain Health and Fitness Overview



CAPT C. Douglas Forcino

Director, Military Operational Medicine Research Program

Chair, Joint Program Committee 5 for Military Operational Medicine

US Army Medical Research and Materiel Command

24 March 2015



DISCLAIMER



The views expressed in this presentation are those of the author(s) and may not reflect the official policy or position of the Department of the Army, Department of Defense, or the U.S. Government.



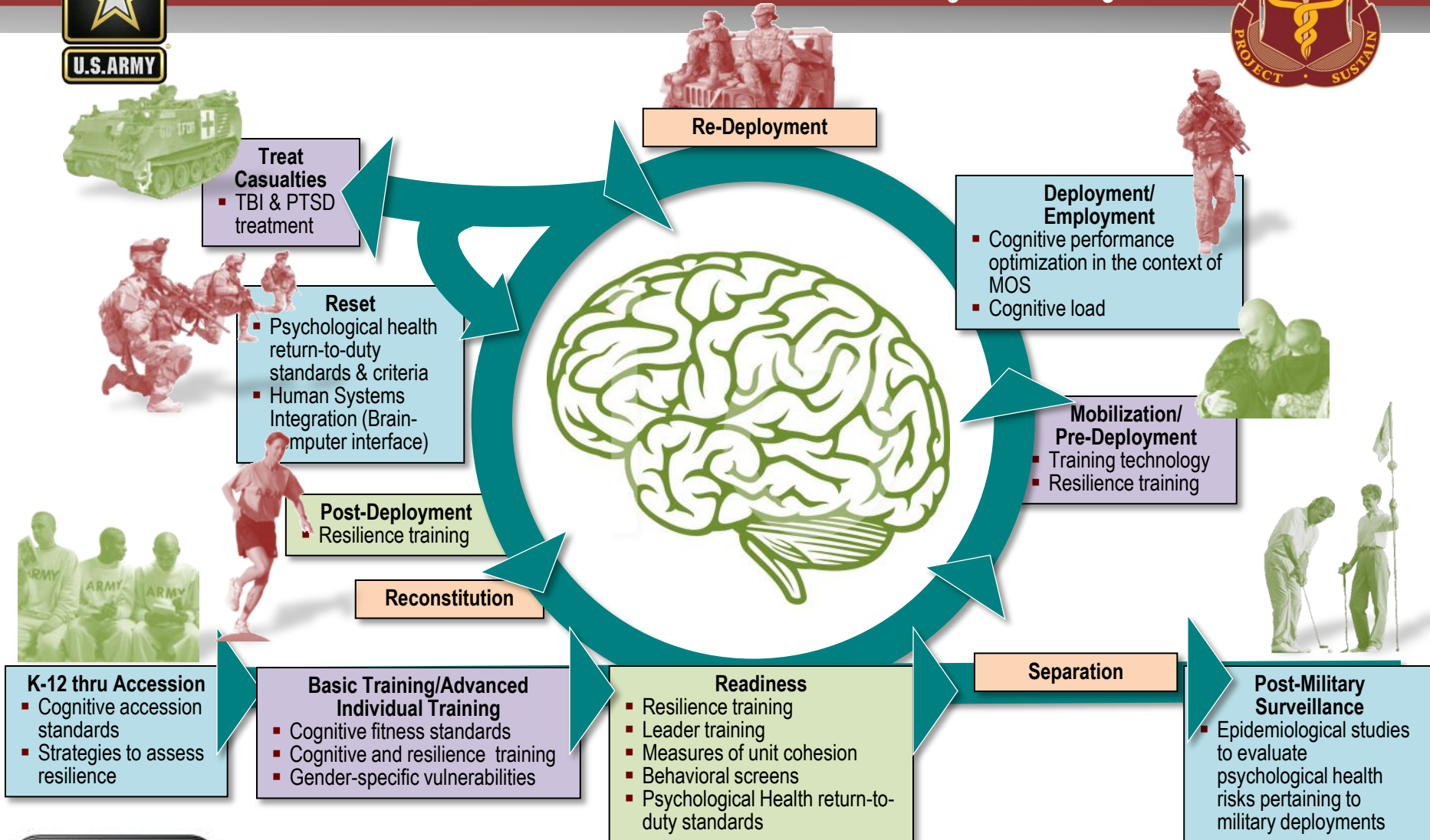
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U.S. ARMY

Brain Health Across the Military Lifecycle



Brain Health: The state of cognitive, psychological, and behavioral fitness which enables peak human performance through the brain's capabilities of attention, reasoning, decision making, problem solving, learning, communicating, and adapting.

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PANEL MEMBERS



- COL Dallas Hack-Traumatic Brain Injury
- LTC Chessley Atchison-Environmental Sensors for Possible Concussive Events
- Dr. Thomas Balkin-Fatigue Management for the Soldier
- Dr. Raymond Genovese-Challenges for Developing New Pharmacologics for the Treatment of PTSD
- Mr. Michael Husband-Neurotrauma and Psychological Health Advanced Development



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Traumatic Brain Injury Overview



COL Dallas Hack

Office of the Principal Assistant for Research & Technology

US Army Medical Research and Materiel Command

24 March 2015



TBI



RESEARCH NEEDS

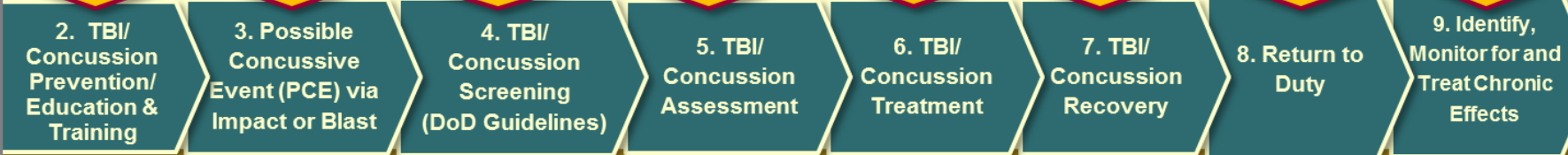
Injury Prevention

RDT&E:

Combat Casualty Care

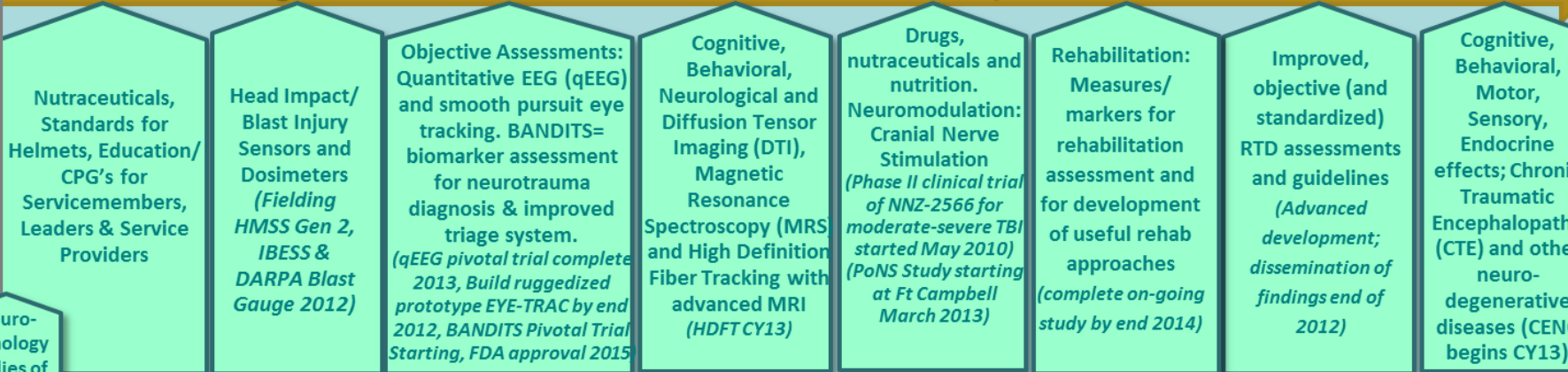
Psych Health and Related Symptoms

1. Basic Science & Epidemiology: 134 studies



Return to Duty/Disability/Reclassification Assessment

Continuing Education and Reinforcement for Servicemembers, Leaders and Service Providers



Neuro-pathology studies of military TBI (Perl/USU)



Environmental Sensors for Possible Concussive Events

MILITARY MEDICINE PARTNERSHIP DAYS
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LTC Chessley R. Atchison

Office of the Principal Assistant for Research & Technology

US Army Medical Research and Materiel Command

24 March 2015

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Purpose



To increase understanding of environmental sensors for the detection of possible concussive events.

- Points

- *Sensor Requirements (G's Measured, PSI measured, battery life, etc.)*
- *Sensor Wear (Fit & Function)*
- *Sensor Validation*
- *Algorithm Development (Math necessary to capture the data)*
- *Algorithm Validation*
- ***Ultimate Goal: Dose Response Curve that predicts the probability of injury based on sensor data!***



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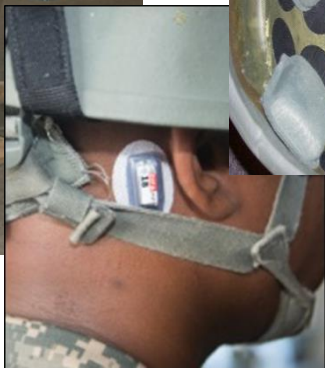


Training Examples



Airborne Training

Combatives Training



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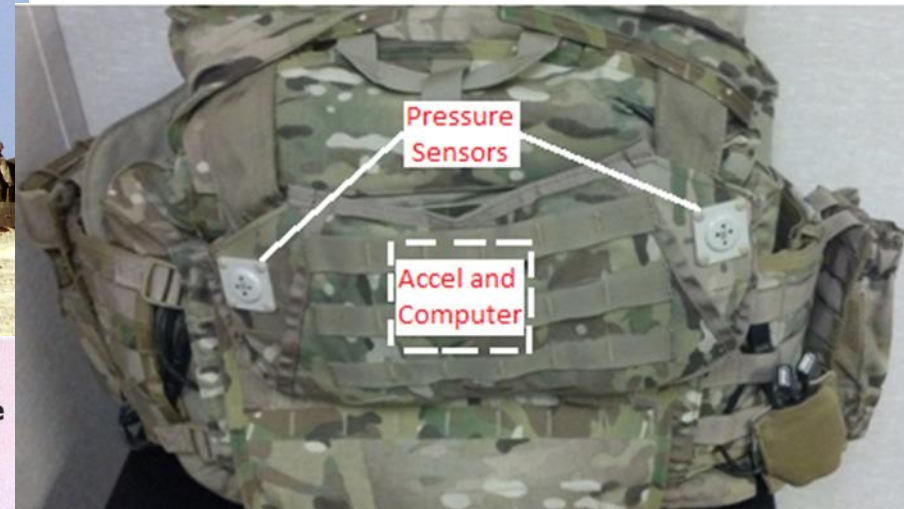
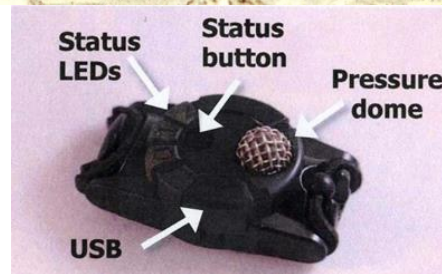




Training Examples



Artillery Training



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Fatigue Management for the Soldier

MILITARY MEDICINE PARTNERSHIP DAYS
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Thomas J. Balkin, Ph.D.

**Behavioral Biology Branch, CMPNS, WRAIR
US Army Medical Research and Materiel Command
24 March 2015**



Purpose



To describe the unique need and capability for implementation of a comprehensive fatigue management system (FMS) in military operations.

- Points

- *Sleep loss impacts both short-term performance/military effectiveness*
- *Sleep loss is ubiquitous in military operations*
- *Three-component military FMS will be complete within 3 years*
- *Remaining need: the platform (e.g., smartphone app?) for fielding of the FMS*



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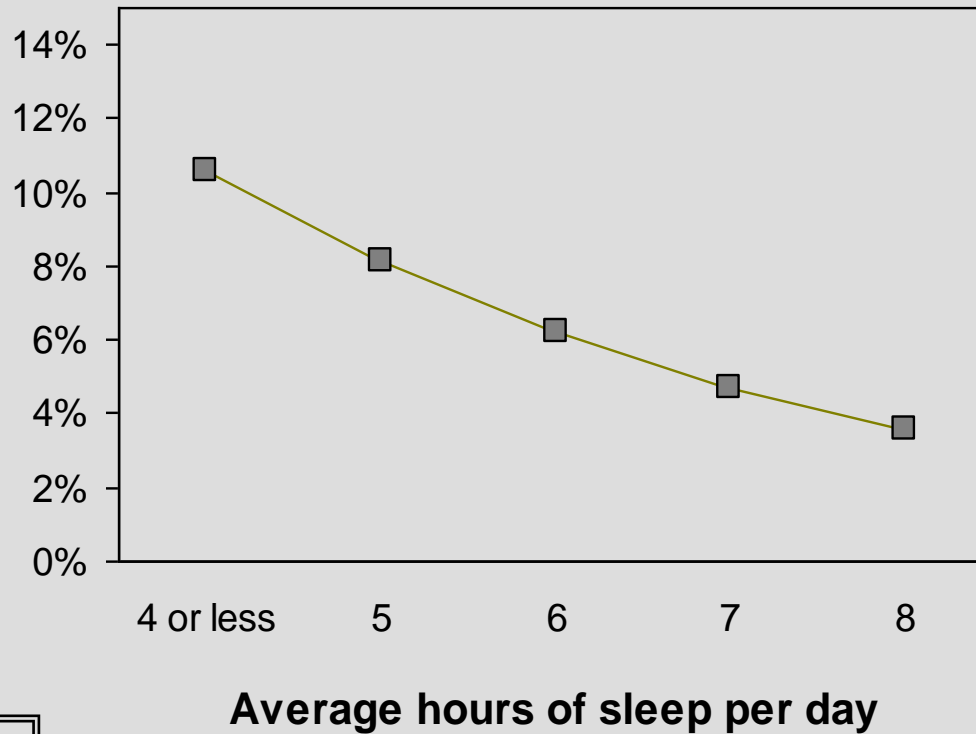




Sleep & Self-Reported Mistakes in OIF



Reported having an accident or mistake that affected the mission



Source: MHAT V data





WRAIR Fatigue Management System



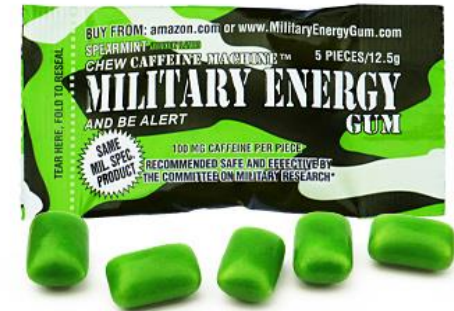
■ Sleep Watch Actigraph

- *Because that which cannot be measured in the field cannot be managed in the field*



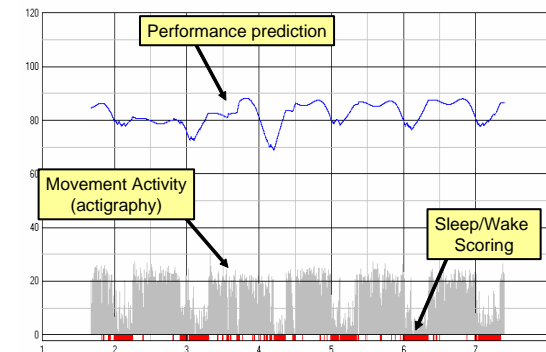
■ An Armamentarium of Fatigue Countermeasures

- *Stimulants to restore/maintain performance during sustained/continuous operations when there is little or no opportunity to sleep*
- *Sleep inducers/counteractants to enhance recuperative sleep when needed*



■ Alertness Management for Military Operations (AMMO)

- *So that operational performance degradation can be anticipated and planned for, and informed decisions regarding dosage and timing of countermeasures can be made.*

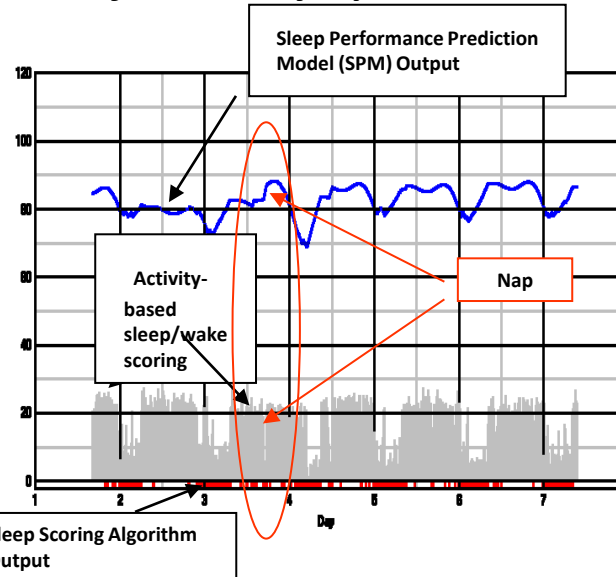




The Final Product



Alertness Management for Military Operations



Soldiers wear wrist actigraph for weeks/months. Activity data serves as input ...

...to sleep scoring algorithm, which in turn serves as input to AMMO....

...the results of which are displayed on the Soldiers' personal technology, where different scenarios can be explored (e.g., what if I take a 30-minute nap at 1400 hrs? What will my performance capacity be at 0200 Hrs tomorrow if I don't get any sleep between now and then? How much benefit will I get from drinking a cup of coffee now, and for how long? etc.)





Challenges for Developing New Pharmacologics for the Treatment of PTSD

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Raymond F. Genovese, PhD

Behavioral Biology Branch, CMPN, WRAIR

US Army Medical Research and Materiel Command

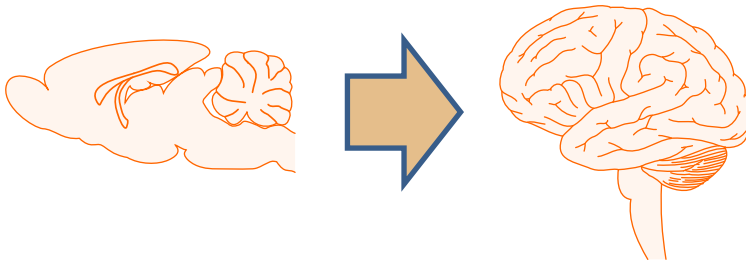
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Objectives



- *Therapeutic protocols for PTSD guided by precision medicine.*
- *Advanced clinical development of PTSD medication in a military population.*



ClinicalTrials.gov

ClinicalTrials.gov is a registry and results database of publicly and privately supported clinical studies of human participants conducted around the world.



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Unique Challenge of PTSD Drug Development



Preclinical Models

Gold Standard Compounds

Extrapolation

Analgesia

Well-established nociception models (e.g., Tail-Flick Hot-Plate) that demonstrate predictive validity.

e.g., Morphine

Facilitated by preclinical models with predictive validity.

Malaria

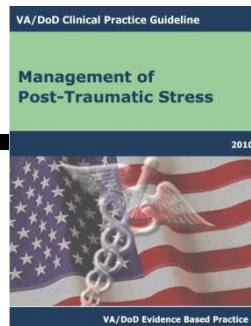
In vitro and in vivo Parasite clearance models that demonstrate predictive validity.

e.g., Chloroquine & Artesunate

Facilitated by preclinical models with predictive validity.

PTSD

Many, but none that have, thus far, demonstrated predictive validity.



Challenged by the difficulty of demonstrating preclinical efficacy.



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New molecules or new applications of molecules demonstrating a convergence of positive data on multiple existing preclinical tests.

Clinical trials targeting innovative and evidence-based approaches, novel pathways, novel applications and combination (pharmacologic and psychotherapeutic) strategies.

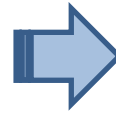
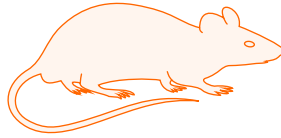
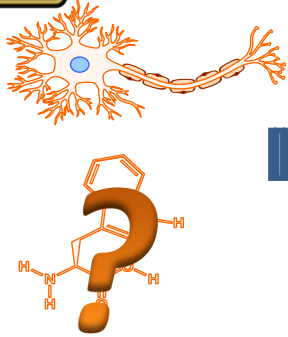


New preclinical tests showing "drive-by" efficacy in a few select instances.

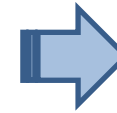




Opportunities and Partnerships



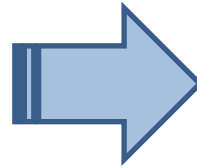
GLP
STUDIES



IND



Novel
compound /
application



Phase I & 2
Clinical Trials



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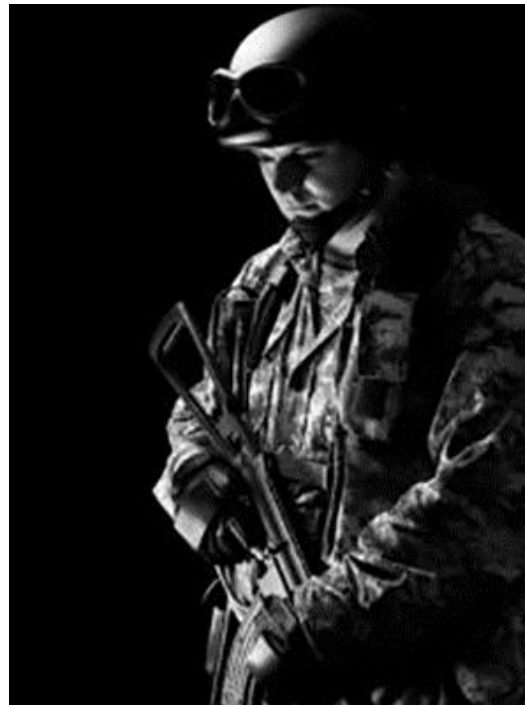




Objective



- *Ability to identify Service Members who may be at higher risk for attempting suicide & interventions to prevent suicide attempts.*



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Suicide Prevention Initiatives



Funded through the Defense Health Program and managed by the Military Operational Medicine Research Program (MOMRP), this innovative cutting-edge research aims to enhance the military's ability to quickly identify those at risk for suicide and provide effective evidence-based prevention and treatment strategies.

<https://www.msrc.fsu.edu/>



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Continuing Needs



- Validated and effective training for bystander intervention.
- Validated and effective training for leader intervention.
- Self-management strategies for reducing suicidal thoughts.



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Neurotrauma and Psychological Health Advanced Development

MILITARY MEDICINE PARTNERSHIP DAYS
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Michael Husband

PM NPH

US Army Medical Research and Materiel Command

24 March 2015



Purpose



Neurotrauma and Psychological Health Project Management Office

Mission: To coordinate and oversee advanced development and acquisition of medical products in Traumatic Brain Injury (TBI) and Psychological Health (PH) that will meet validated Warfighter needs through the execution of approved research, development, and acquisition (RDA) programs.

Vision: Leading the development of innovative, evidence-based solutions for TBI and PH.

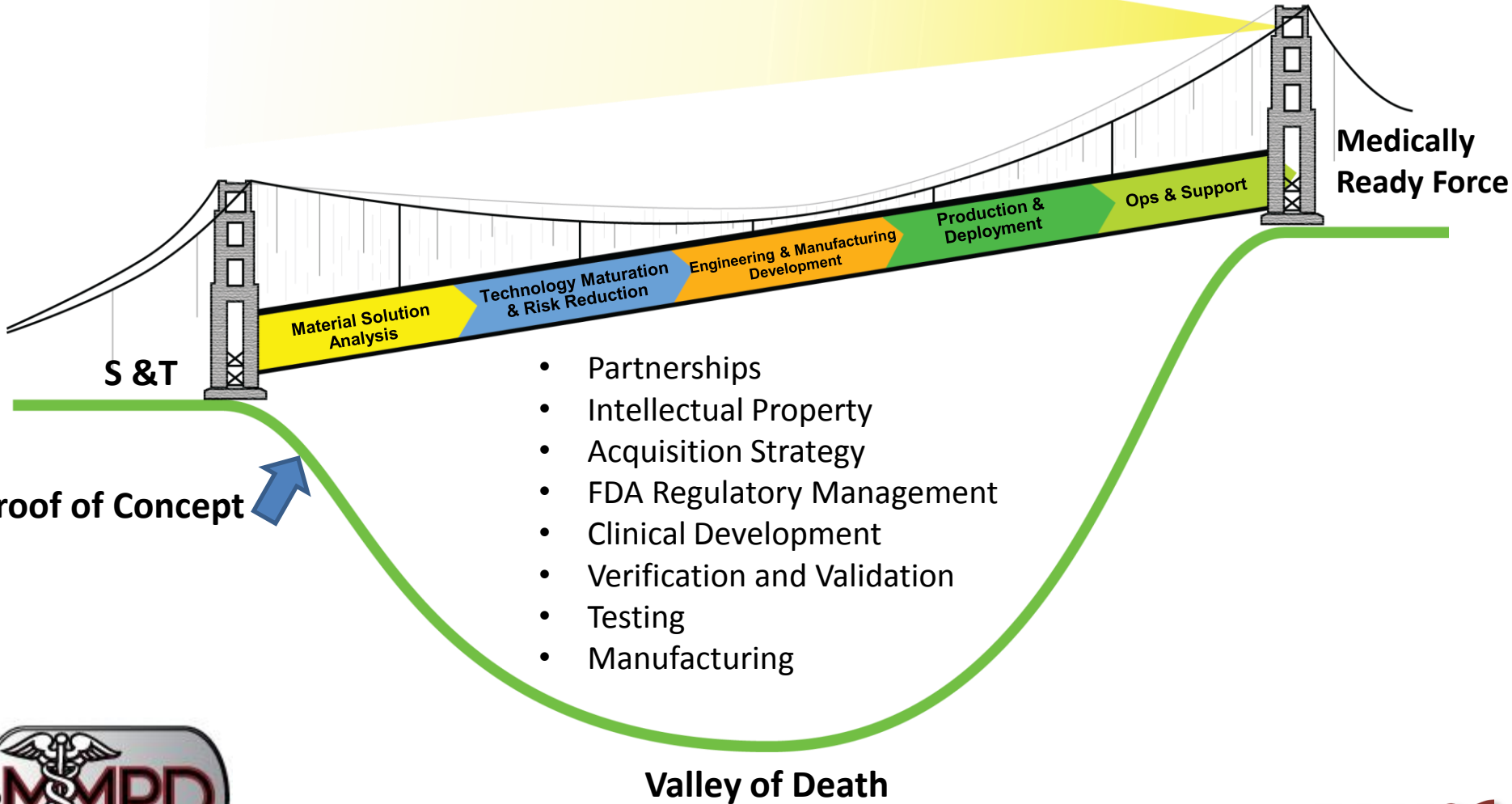


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DoD Advanced Development





Psychological Health



1. Drug

- *Repurposing*
- *Novel molecular entities*
- *State of the Science Summit – November 2015*

2. Biomarker

- *Use in diagnostics*
- *Use to assess endpoints in clinical trials*
- *Use to identify targets for intervention*

3. Device

- *Treatment of Posttraumatic Stress Disorder (PTSD): Invasive and Non-invasive*
- *Suicide prevention: Detection of dynamic risk*

4. Knowledge Product

- *Enhancing psychotherapies with medications or devices*
- *Clinical implementation*



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Traumatic Brain Injury



1. Drug

- *Treatment of injury*
- *Treatment of symptoms*

2. Biomarker

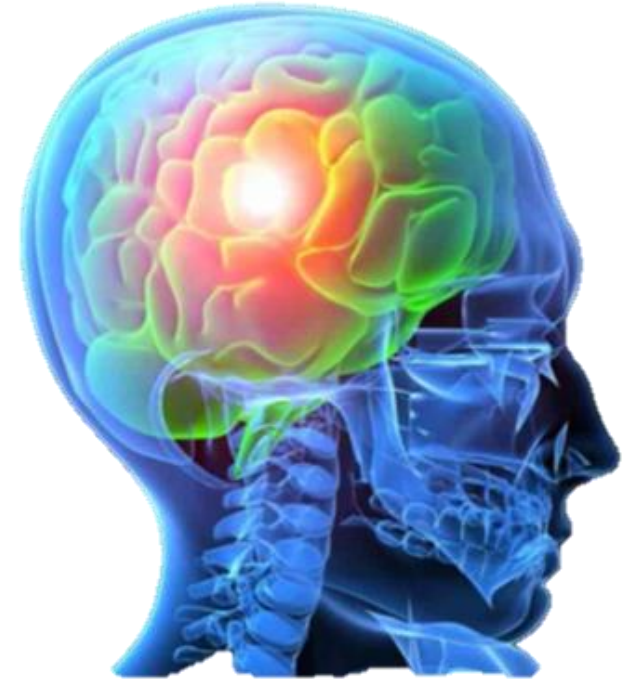
- *Baseline risk*
- *Acute diagnosis*
- *Identification of potential subtypes*
- *Prognosis*
- *Use to assess endpoints in clinical trials*
- *Use to identify efficacy of treatment*

3. Device

- *Treatment of TBI: Invasive and Non-invasive*
- *Diagnostic: Aid to clinical assessment and patient management*

4. Knowledge Product

- *Standards for clinical assessment and treatment*
- *Clinical implementation*

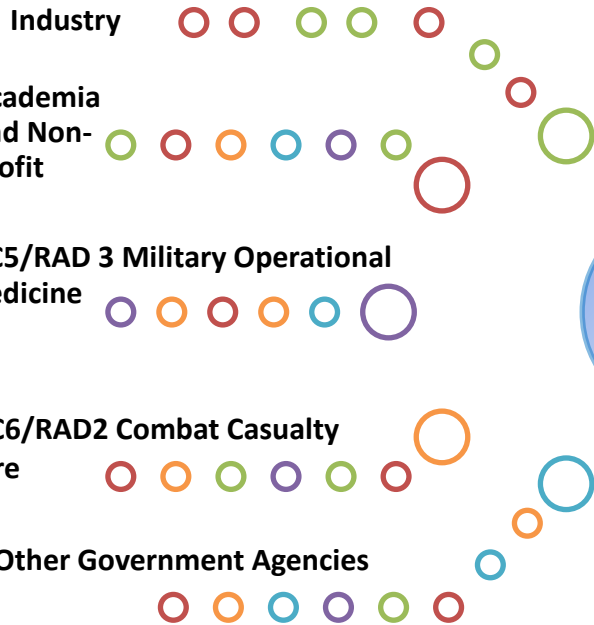


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Product Life Cycle



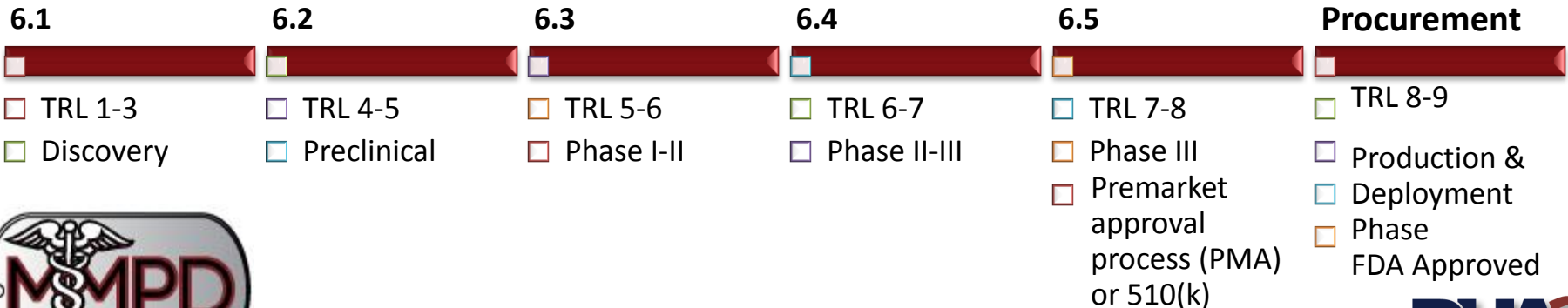
NPH
PMO



Advanced Development

Technology Transfer

- Knowledge Product
- Drug Treatment - PH
- Drug Treatment - TBI
- Diagnostics - TBI
- Diagnostics - PH



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It is estimated that over 2.3 Million US Service Members deployed 2001-2014



Incidence of TBI

Incidence of PH Conditions

313,816 documented TBIs (2000-3QFY14) with over 80% classified as mild TBI and 9% moderate/severe TBI, 9% Unknown¹
(over 80% of TBIs are diagnosed in a non-deployed setting. TBI will remain a military concern long after withdrawal from Afghanistan.)

- The average costs for the first year of treatment for returning veterans \$11,700²
- Direct medical costs and indirect costs of TBI, such as lost productivity, totaled an estimated \$60 billion in the United States in 2000.⁹

Average civilian hospital stay: Mild - 1 day per event; Moderate – 6 to 7 days per event; Severe - 17-18 days per event.
Rehabilitation length of stay average 55 days.

According to the CDC, falls are the leading cause of TBI, while motor-vehicle-traffic injury is the leading cause of TBI death
Death rate from CDC = 3% of all TBIs.⁴
TBI is a contributing factor to a third of all injury-related deaths in the US.⁸

Mental Disorder

- 2000 – 2012: 159,107 active service members experienced 192,317 mental disorder hospitalizations.⁵
- 2006 – 2009: > 50% increase (10,262 to 15,328) in hospitalizations from PTSD, alcohol abuse and dependence, adjustment disorder related to combat experience⁶

PTSD and Major Depression

- 2001 – 2008:
 - \$4 - \$6.2 billion = total cost for PTSD and depression in the first two years following redeployment³
 - 1.6 million total Iraq or Afghanistan veterans

PTSD

- 11-20% of OEF/OIF Veterans have PTSD¹⁰
- Average costs for the first year of PTSD treatment for a returning veteran = \$8,300²

Suicide

- Beginning in 2010: second-leading cause of death for active duty service members, behind war injuries.⁶
- 200 deaths by suicide in active duty service members in 1998, rising to 349 in 2012⁷



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Questions?



For additional questions after the conclusion of the conference, send an email message to usarmy.detrick.medcom-usamrmc.mbx.mmpd@mail.mil

