Train, Treat and Rehabilitate

US Army Medical Research and Materiel Command

19 April 2016

Panel Members

- Lt Col Jennifer Hatzfeld
  - Combat Casualty Care Research Program
- Dr. Stephen Toth
  - US Army Medical Materiel Agency
- Dr. Tony Gover
  - Clinical and Rehabilitative Medicine Research Program
- Dr. Janet Harris – Panel Chair
  - Medical Simulation and Information Sciences Research Program
- COL Dan Irizarry
  - Joint Project Office for Medical Modeling and Simulation

Treat:
The Challenge & Privilege of Caring for Combat Casualties

Lt Col Jennifer Hatzfeld, PhD, RN
Combat Casualty Care Research Program

Stephen Toth PhD (CTR)
US Army Medical Materiel Agency

US Army Medical Research and Materiel Command

April, 2016

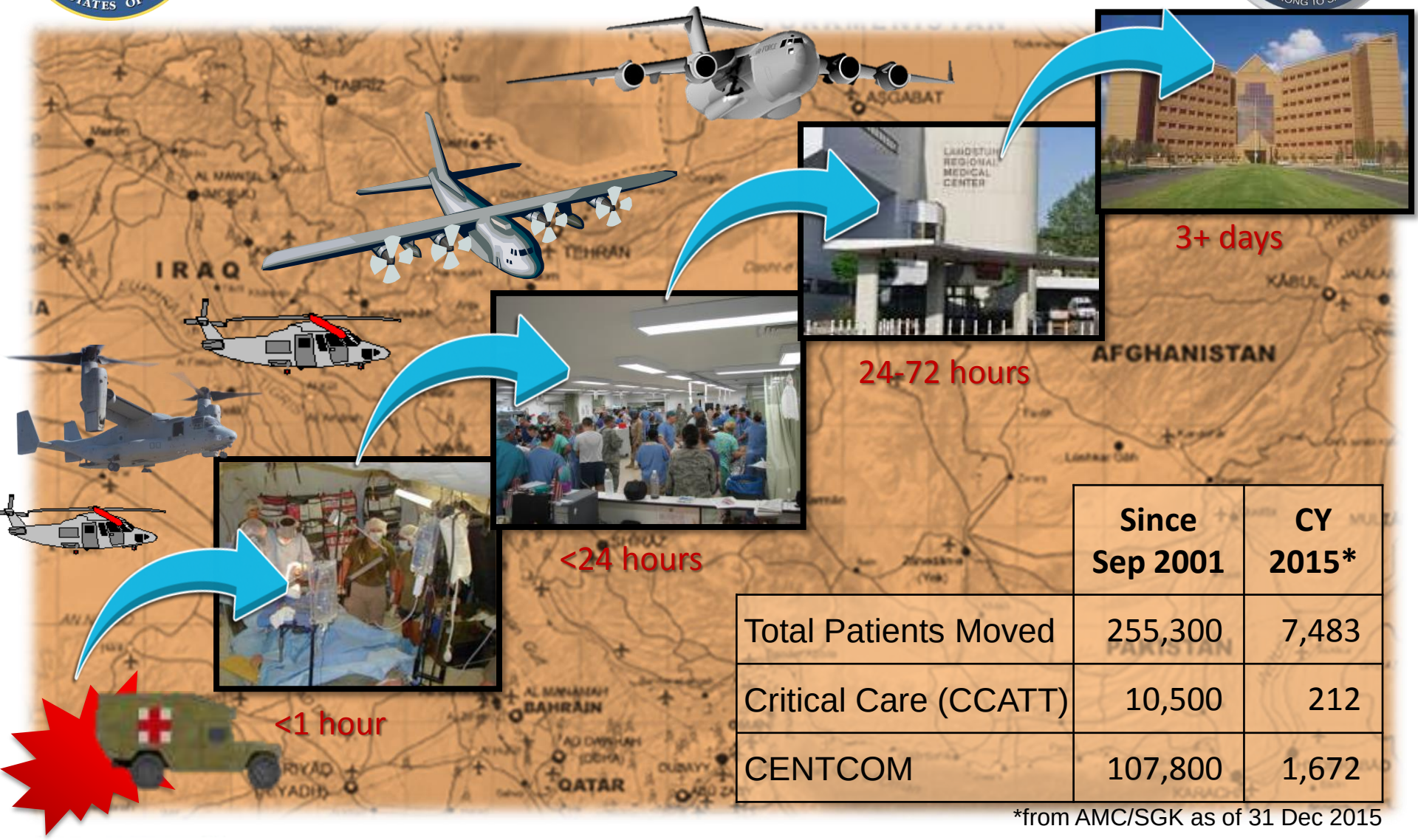
Purpose

Excellence in Combat Casualty Care Requires Focused, Gap-Driven Research

Key Concepts:

- Current & Future Challenges
- Research Priorities
- Near-term and Long-term Approach
- Advanced Development Key Concepts

A Seamless Continuum of Care

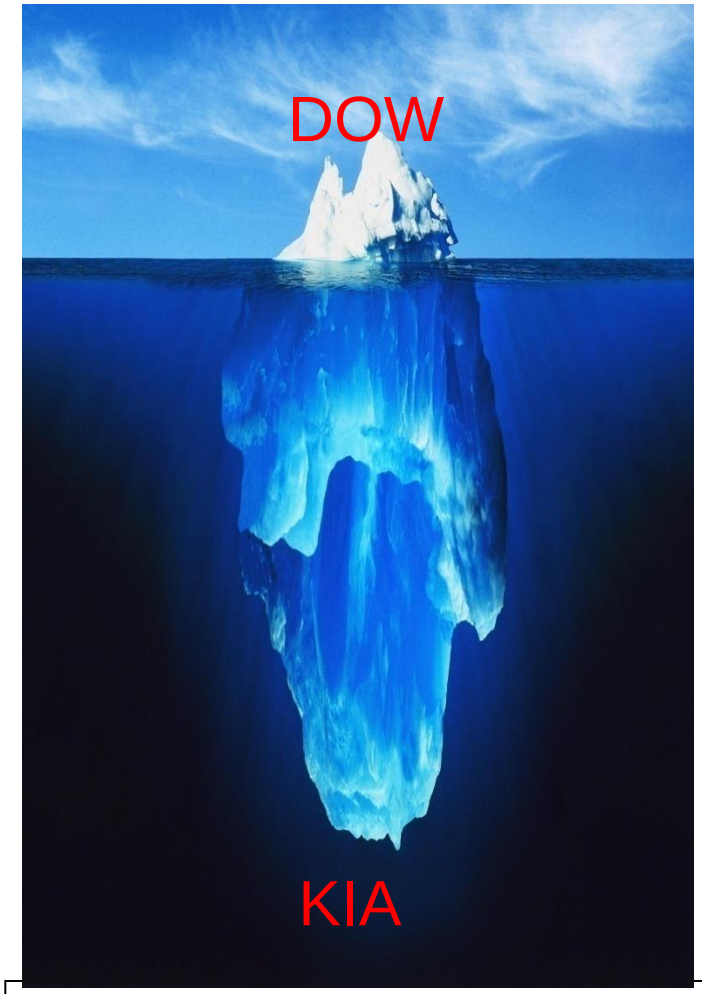


	Since Sep 2001	CY 2015*
Total Patients Moved	255,300	7,483
Critical Care (CCATT)	10,500	212
CENTCOM	107,800	1,672

*from AMC/SGK as of 31 Dec 2015

Combat Deaths

4,596 US Military Combat Deaths (2001-11)



Killed in Action analysis, COL Brian Eastridge et al. 2012

Died of Wounds (Role II and above)
506 deaths

Killed in Action (Level I) 4,090 deaths	
Total Pre-MTF Combat Deaths	4,090
Potentially Survivable Deaths	1,075 (26%)
Hemorrhage	984 (91.5)
Airway	69 (6.4)
Other	22 (2.0)
Potentially Survivable Hemorrhage	984 (24%)
Truncal	675 (17%)
Junctional	170 (4%)
Extremity	139 (3%)

Median Evacuation Time (first surgical capability)	
2001-June 2009	90 min
June 2009-Present	43 min

Evacuation time analysis Col Russ Kotwal et al., 2015

Combat Casualty Outcomes

Each Action Influences Future Decisions & Outcomes:

Role 1-2S

- Limited resources/blood
- Limited staff
- Limited holding/ICU/ evac to next level
- Resources easily overwhelmed

Role 3

- Theater "hospital"
- Surgical specialties/ CT scanner
- Resources overwhelmed with evacs from multiple Role 2s
- Consider ICU capacity

Evacuation to Role 4/5

- What is needed to enable move out of theater

Traumatic Brain Injuries in Military

DoD Numbers for Traumatic Brain Injury

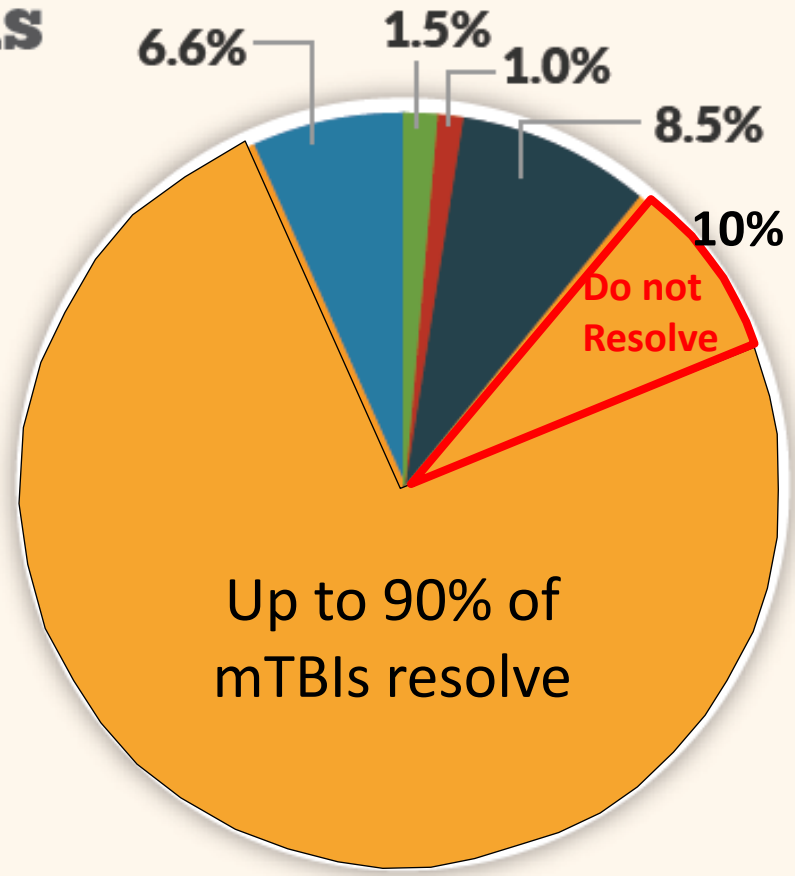
Worldwide – Totals

2000-2015 Q1-Q2

Penetrating	4,904
Severe	3,463
Moderate	28,192
Mild	274,568
Not Classifiable	22,042
Total - All Severities	**333,169**

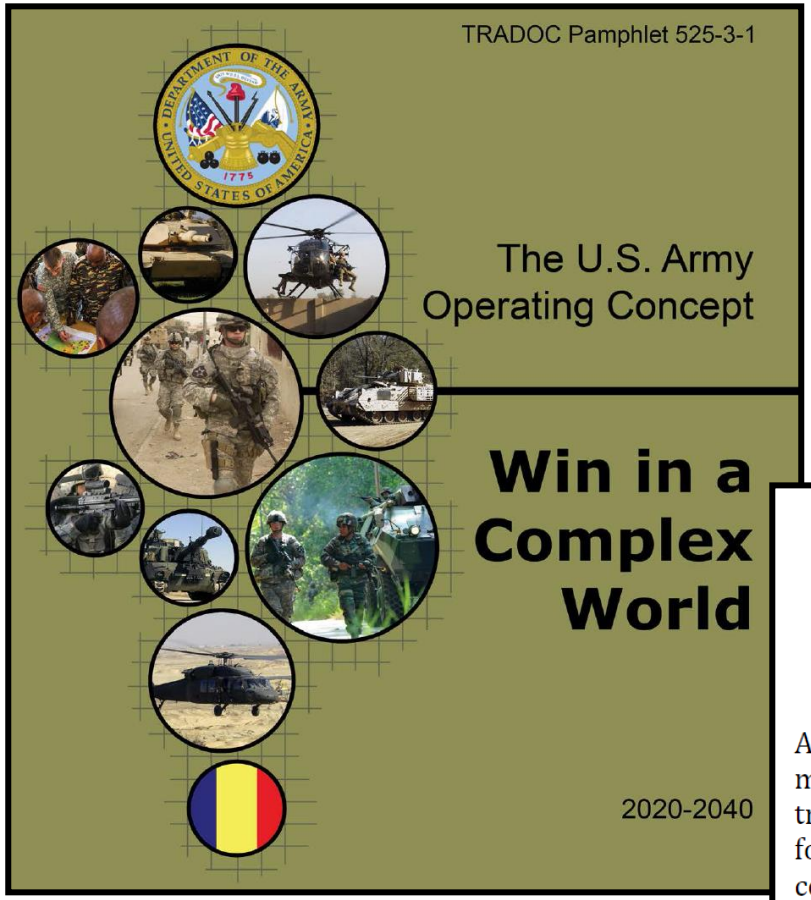
Source: Defense Medical Surveillance System (DMSS), Theater Medical Data Store (TMDS) provided by the Armed Forces Health Surveillance Center (AFHSC)

Prepared by the Defense and Veterans Brain Injury Center (DVBIC)



2000-2015 Q1-Q2 , as of Aug 18, 2015

Future Challenges



New more complex scenarios

PROLONGED FIELD CARE WORKING GROUP POSITION PAPER

PROLONGED FIELD CARE CAPABILITIES

JUNE, 2014

A newly formed Prolonged Field Care Working Group (PFC WG), comprised of medical-specialty subject matter experts, has been tasked to evaluate the current training and preparedness of Special Operations Force (SOF) medics. The first formal position paper from the working group suggests that medical providers consider the below list of capabilities when preparing their medics to provide PFC in austere settings. It is presented in a "minimum, better, best" format. The intent is to demonstrate those basic skills, with adjunctive skills and equipment that may be employed when considering what to train for Prolonged Field Care (PFC).

Key Gaps in Combat Casualty Care

- Decrease preventable deaths
  - Hemorrhage and Resuscitation
- Improve long-term outcomes
  - Brain and Spinal Cord Injuries
  - Surgical Management Capability
  - Safe Patient Transport
- Develop the ability to provide medical care in future complex scenarios

DoD Combat Casualty Care Priorities for Medical Research & Development

Tier 1	Tier 2	Tier 3
Manage blood circulation/ control hemorrhage	Maintain psychological functioning	Identify and manage fractures/wounds
Treat for shock	Recognize signs of psychological trauma	Identify/manage infectious & contaminated patients
Preserve life	Treat disease	Evaluate for return to duty
Manage breathing/airway	Maintain tissue viability	Mental rehabilitation
Maintain brain function	Manage head and spine	Patient documentation and communication
	Pain management	
	Repair physical injuries throughout the body	
	Maintain sensory systems	
	Triage Initial Injuries	
	Prevent loss of/ use of limb(s)	

Combat Casualty Care Research Program

Vision: Optimize survival and recovery from combat related injury in current and future operational scenarios

Mission: To drive medical innovation through development of knowledge and materiel solutions for the acute and early management of combat-related trauma; including point-of-injury, en-route, and facility-based care

CCCRP Portfolios

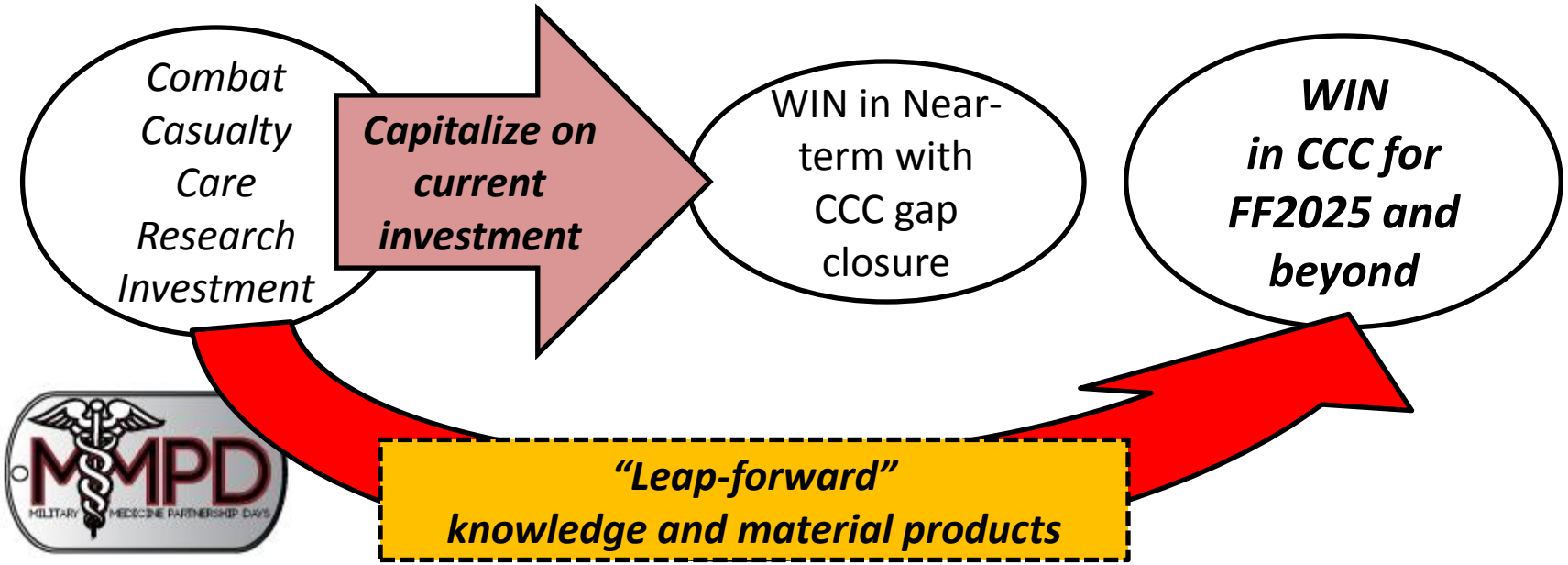
The Combat Casualty Care Research Program is separated into Five Portfolios:

- Hemorrhage Control & Resuscitation
- Neurotrauma / Traumatic Brain Injury
- Forward Surgical Intensive Critical Care
- En-route Care
- Military Medical Photonics

Combat Casualty Care Research

Question: How does the ***MHS*** "win in a complex world"?

Answer: 1) Create ***simplified*** solutions for complex problems
2) ***Push solutions forward*** on the battlefield



Combat Casualty Care Research

DRIVE Research, Development, Acquisition of Knowledge and Materiel Solutions…

MHS/ AMEDD postured to WIN in a Complex World

Near Term :

- capitalize on current RDA efforts
- Develop solutions for prolonged DCR scenarios (pDCR)

Role 3 | Role 2 | Role 1/POI












Combat Casualty Care Research

DRIVE Research, Development, Acquisition of Knowledge and Materiel Solutions…

MHS/ AMEDD postured to WIN in a Complex World

Mid/Long Term:

- Invest in "leap forward" S&T
- Simplify products so that capabilities can be PUSHED FORWARD

Role 3 Role 2 Role 1/POI















Origin of Solutions

S&T

- **Military Infectious Diseases Research Program** (MIDRP) RAD 1 - IIPT/JPC-2 (ICD)
- **Combat Casualty Care Research Program** (CCCRP) RAD 2 - IIPT/JPC-6 (ICD)
- **Military Operational Medicine Research Program (**MOMRP) RAD 3 - IIPT/JPC-5 (ICD)
- **Clinical & Rehabilitative Medicine Research Program** (CRMRP) RAD 5 - IIPT/JPC8 (ICD)
- **Armed Forces Institute of Regenerative Medicine** (AFIRM)
- **Medical Chemical Biological Defense Research** IIPT/JPC-1 – (ICD)
- **Congressionally Directed Medical Research Program** (CDMRP)
- **DoD Blast Injury Research Program Coordinating Office**
- **Telemedicine Advanced Technology Research Center** (TATRC)

COTS evaluation for Army 's best-value

COTS ready to be used

Industry / Commercial off-the-Shelf

MDD Enter Into Decision Gate (ICD)

MS A Advance Development is engaged as Co-Chair to PLRC/IPT (ICD)

MS B Advance Development is Chair of PLRC/IPT Program of Record (CDD)

MS C Production & Deployment (CPD)

Lessons Learned Include

Understanding the Limitations, Recognizing the Risks, Implementing Appropriate Interventions:

- Particularly during prolonged care environment

The Tool is Important however:

- Knowledge on How, When, Where, When not to, etc. is equally critical to successfully save lives and wholeness of the individual soldier
- Each soldiers wound is unique

Lessons Learned Include (Cont.)

Training Critical:

- Developing the appropriate training needs for the expected application of product in various theaters and roles – particular military roles and scenarios

Planning – particularly incorporate Regulatory Considerations Early in the Development process:

- Efficient and cost effective development
- Effective stewardship of tax payer dollars

Clinical & Rehabilitative Medicine Research Program

Dr. Tony Gover, Civilian Deputy Director
Clinical & Rehabilitative Medicine Research Program
US Army Medical Research & Materiel Command
19 April 2016

Purpose

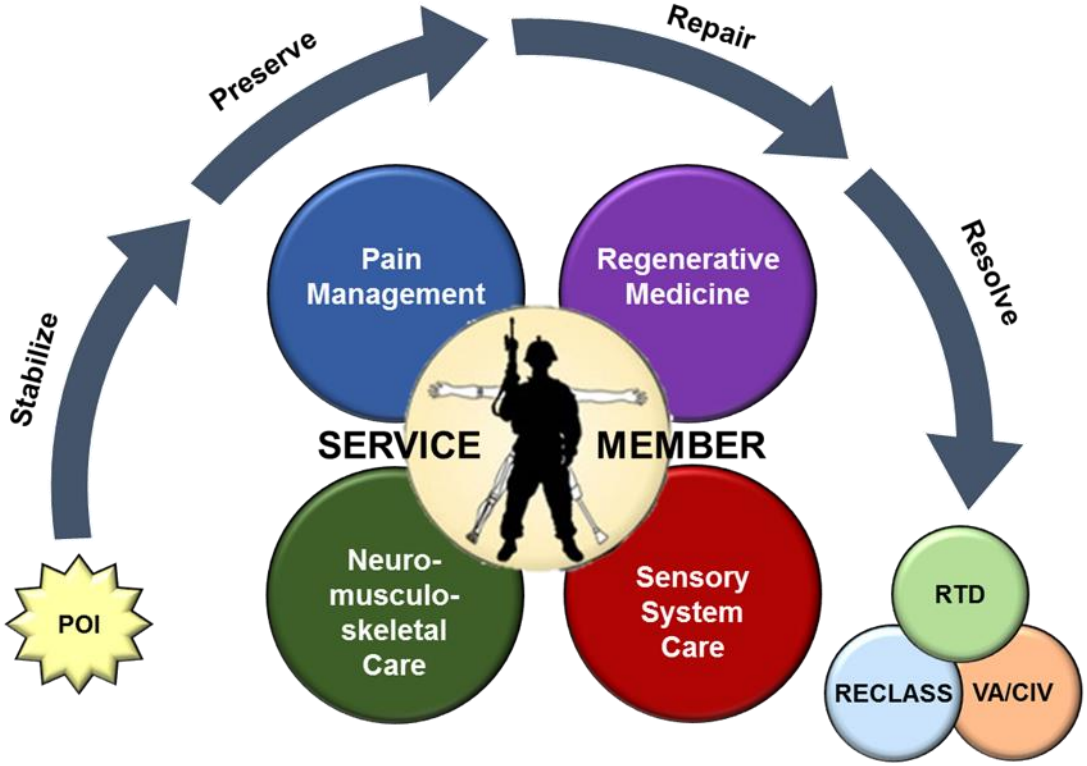
To increase understanding of the Clinical & Rehabilitative Medicine Research Program (CRMRP), the CRMRP Program Areas, and the Program Areas' objectives.

- Outline
  - ***CRMRP Overview***
  - ***CRMRP Program Areas***
  - ***Pain Management***
  - ***Regenerative Medicine***
  - ***Neuromusculoskeletal Injury***
  - ***Sensory Systems***

CRMRP Overview

Mission

To implement long-term strategies to develop knowledge and materiel products to reconstruct, rehabilitate, and provide definitive care for injured Service Members. ***The ultimate goal is to return the Service Member to duty and restore their quality of life.***



CRMRP Program Areas

Pain Management: Management of pain ranging from the point of injury to chronic pain management

Regenerative Medicine: Extremity and craniomaxillofacial injuries, burns and scarless wound healing, hand and face transplants, genitourinary lower abdominal reconstruction

Neuromusculoskeletal Injury: Prosthetics, orthotics, spinal cord injury, and orthopedic injury rehabilitation

Sensory Systems: Visual, auditory, and vestibular dysfunction associated with traumatic injury

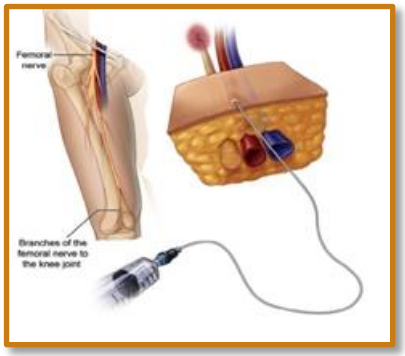
Pain Management

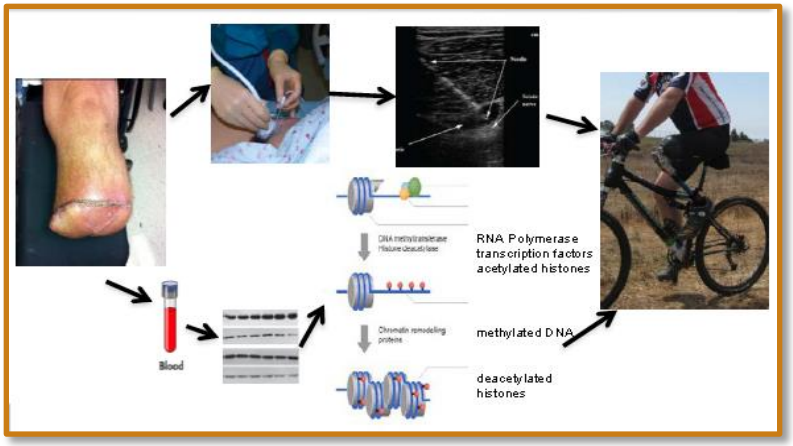
Pain Management includes research (applied science to advanced development) for the management of pain ranging from point of injury to chronic pain management.

Purpose: Provide products and information solutions for the diagnosis and alleviation of battlefield, acute and chronic pain and sequela.

Top PMT Objectives:

1. Investigate battlefield pain management strategies
2. Investigate precision medicine/ personalized pain management strategies
3. Investigate treatment approaches for chronic pain in complex patients
4. Validate non-pharmacological approaches to pain management





Regenerative Medicine

Regenerative Medicine includes research (applied science to advanced development) in repair, reconstruction or regeneration of tissue lost or damaged from traumatic injury in the areas of: extremity injury, craniomaxillofacial injury, burns/scarring, composite tissue transplantation, and genitourinary/lower abdomen reconstruction.

Purpose: Restoration of form and function to injured bone and soft tissues.

Top RM Objectives:

1. Identify/evaluate technologies that increase speed and completeness of healing following volumetric muscle loss, peripheral nerve and vascular injury
2. Identify/evaluate technologies that increase speed and completeness of skin healing following burn injuries
3. Identify/evaluate technologies to generate and integrate functional composite tissues

Neuromusculoskeletal Injury

Neuromusculoskeletal Injury includes research (applied science to advanced development) in rehabilitation/reintegration in the areas of amputation/prosthetics, limb trauma/orthotics, spinal cord injury, and other service-related neuromusculoskeletal injury.

Purpose: Maximized rehabilitation after service-related neuromusculoskeletal injuries.

Top NMS Objectives:

1. Development/evaluation/validation of new and existing reintegration interventions
2. Evaluation of afferent/efferent systems toward enhanced and intuitive control of prosthetics
3. Identifying biomarkers of secondary health deficits
4. Evaluation/validation of dose, timing, frequency, and duration of rehabilitation

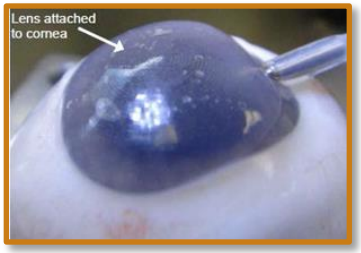
Sensory Systems

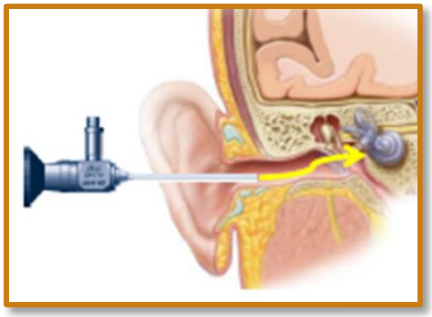
Sensory Systems includes research (applied science to advanced development) focused on understanding the mechanisms of and developing treatment strategies for traumatic injuries resulting in visual, auditory, and vestibular dysfunction.

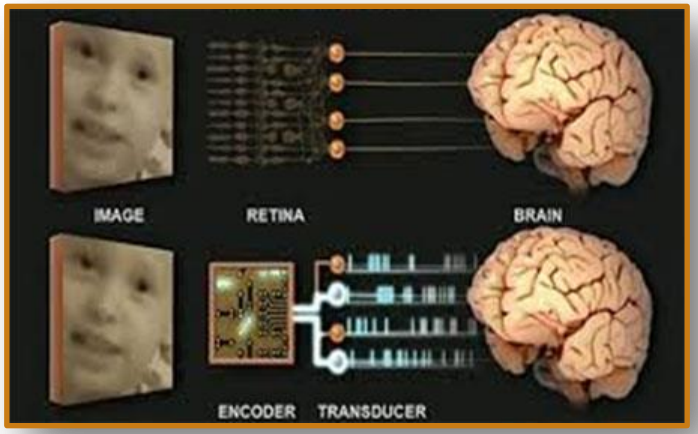
Purpose: Restore and rehabilitate sensory systems (vision, hearing and balance) following traumatic injury.

Top SS Objectives:

1. Identify/evaluate optimal corneal treatment options
2. Identify/evaluate regenerative and pharmaceutical therapies for restoring and treating optical nerve injuries
3. Quantify impacts of TBI on multisensory integration and balance to aid diagnosis and treatment post-injury







Medical Simulation and Information Sciences Research Program

Janet R. Harris, RN, PhD
Director, Medical Simulation and Information Sciences Research Program

COL Dan Irizarry, MC
Clinical Advisor, Joint Project Office for Medical Modeling and Simulation

US Army Medical Research & Materiel Command

Program Executive Office for Simulation, Training, & Instrumentation

19 April 2016

Purpose

To increase understanding of the Medical Simulation and Information Sciences Research Program (MSISRP), the MSISRP Program Areas and objectives, and transition processes

- Outline
  - ***MSISRP Overview***
  - ***MSISRP Program Areas and Objectives***
  - ***Joint Project Office for Medical Modeling and Simulation***

MSISRP Overview

Mission

To responsively and responsibly coordinate emerging military medical simulation and health information technologies/informatics research across all stakeholder communities and transfer research solutions and knowledge to meet MHS goals.

Medical Simulation & Training

Health Informatics Technology Research

MSISRP Program Areas

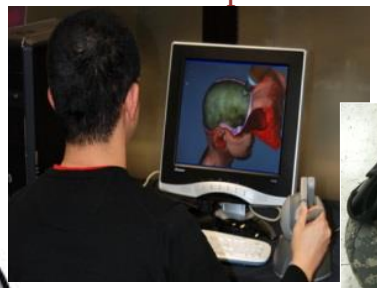
Medical Simulation & Training

Combat Casualty Training Initiative: Examine the efficacy of modern simulation system technology vs. current models for advancing pre-hospital trauma training

Medical Readiness Initiative: Focuses on medical provider training systems and assessment of competence for sustained military medical readiness

Health Focused Initiative: Advanced user interface and interactive technologies for healthy living, patient education, increased compliance & rehabilitation

Tools for Medical Education: Effort to promote medical simulation related technologies by providing tools for providers to easily develop new products and content. This is done by promoting software development kits and open architecture tools for widespread developer community use



Health IT/ Informatics

Theater/Operational Medicine: Provide services to the Armed Forces to promote, improve, conserve or restore personnel mental or physical well-being through improved information management and use of emerging technologies

Military Health Care Services: Directly impact the way patient care is provided and improve medical provider ability to treat patients and promote health

Infrastructure & Data Management: Improve IT and communications infrastructure, architecture and management structure

Medical Resourcing: Improve delivery of healthcare support, personnel, and training resources around the globe

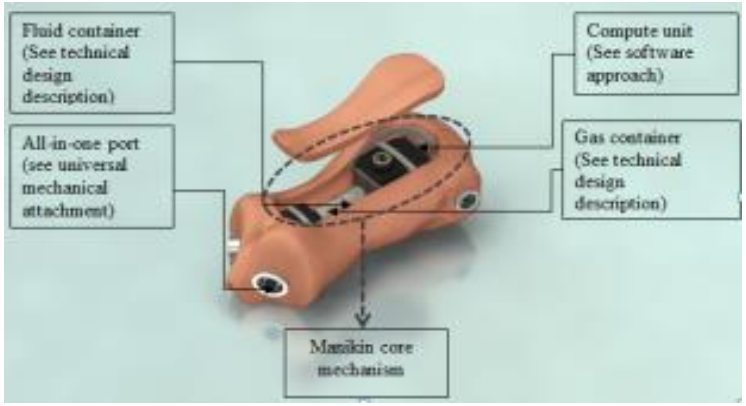
Combat Casualty Training

Combat Casualty Training includes research (applied science to advanced development) for advancing material properties and virtual models to close the gap between training systems and the real thing (human tissue).

Purpose: To advance combat casualty training tools in simulation, virtual and augmented reality.

Top CCT Objectives:

1. R&D material property and VR models to represent appropriate/dynamic tissue response
2. Investigate multi-trauma and mass causality scenarios
3. Deliver more efficient and effective methodologies for team training and joint en route care



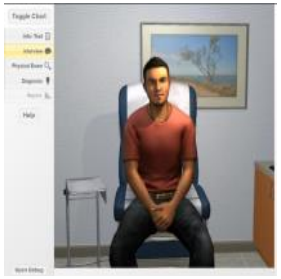
Medical Readiness Initiative

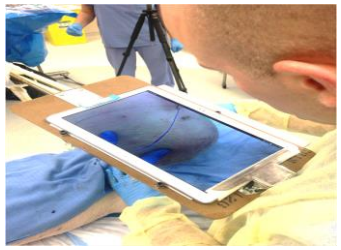
Medical Readiness Initiative includes research (applied science to advanced development) focusing on skill acquisition / skill maintenance learning curves and minimizing skill decay (degradation) to reduce harmful effects of decay in all roles of military medical care.

Purpose: To focus on medical provider training systems and assessment of competence to sustain military medical readiness.

Top MRI Objectives:

1. Research/develop predicative models to accelerate to proficiency or mastery level
2. Research/develop simulation system tools that will improve decision making and provide more predicable pre-surgical/intervention rehearsal
3. Research/develop potential predictors of how training transitions to the clinic/theatre
4. RDT&E of assessment (Tutoring) Systems





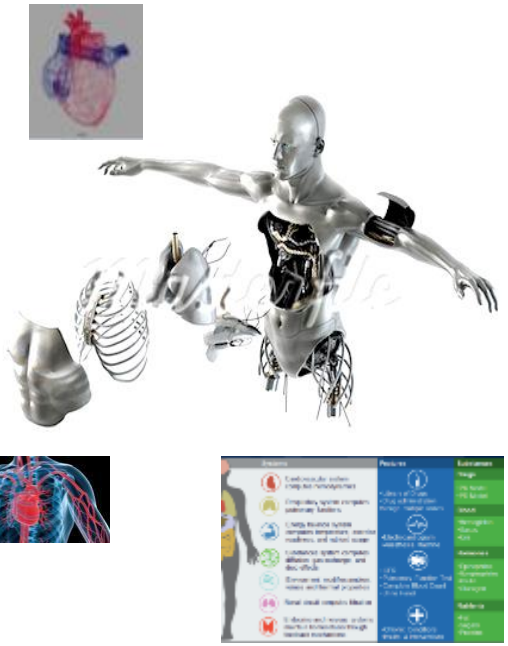
Tools for Medical Education

Tools for Medical Education includes research (applied science to advanced development) to maximize system and organization-level return on investment, increase available training opportunities, and minimize training burden to the medical modeling, simulation, training, and education community.

Purpose: To develop and test trans-disciplinary, open source training platforms, toolkits, and models.

Top TME Objectives:

1. Resource sharing by advocating open source/open architecture
2. Leverage collaborative research projects through medical models and libraries
3. Democratization of knowledge and products through training platforms and tools that deliver healthcare content



Theater/Operational Medicine

Theater/Operational Medicine (TOM): includes research (applied science to advanced development) to provide services for Armed Forces to promote, improve, conserve or restore personnel mental or physical well-being through improved information management and emerging technologies

Purpose: To provide comprehensive health services to deployed forces in an operating environment characterized by highly distributed operations and minimal, if any, pre-established health service infrastructure

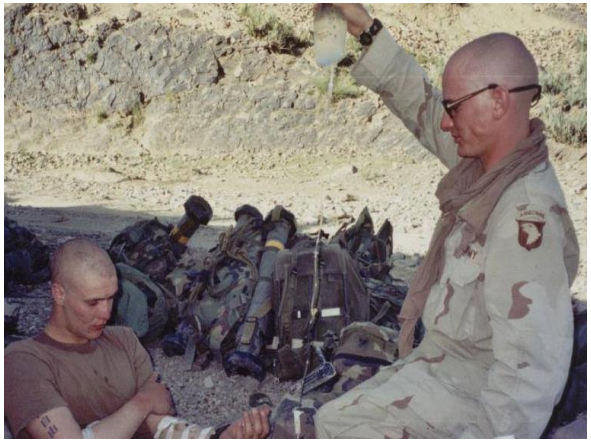
Top JPC1-TOM Objectives:

1. Development of Common Joint C2 systems user Interface
2. Evaluate of Passive Identification methods (i.e. sensors) to solve Equipment tracking, inventory and other equipment Management Issues
3. Validation of Joint synchronous/ asynchronous Teleconsultation for deployed healthcare professionals at all levels of care

Theater/Operational Medicine

Theater/Operational Medicine (TOM): includes research (applied science to advanced development) to provide services for Joint Armed Forces to promote, improve, conserve/restore warfighter mental or physical well-being through improved information management and emerging technologies

Purpose: Theater treatment facilities must be task organized, with a minimized footprint and proportionally supported by patient evacuation and medical logistics assets



(CONT'D) Top JPC1-TOM Objectives:

4. Demonstration of Data interoperability/transfer/storage and management requirements for use of medical devices and patient data in a closed loop to deliver medical care during unmanned evacuation
5. Demonstration and validation of Hands-free medical data entry at point-of-care in disruptive environments
6. R&D medical devices' data interoperability, integration and availability to supply autonomous clinical workflow solutions

Military Health Care Services

Military Health Care Services (MHCS): includes research (applied science to advanced development) on healthcare services that directly impact the way patient care is provided and improve medical provider ability to treat patients and promote health.

Purpose: Lack of integrated interoperable processes and systems to execute logistics, health care delivery, and research and development

Top JPC-1 MHCS Objectives:

1. Medical Device Plug-and-Play (MD PnP) Interoperability Standardization Program
2. Development Integrated Clinical Environment (ICE) Supervisor - Medical Device Simulator
3. Enhancing mHealth Technology in the PCMH Environment to Activate Chronic Care Patients: A Feasibility Study

Infrastructure & Data

Infrastructure & Data Management (IDM): includes research (applied science to advanced development) to explore improved IT and communications infrastructure, architecture and management structure

Purpose: to manage the specialized medical products and services necessary to ensure their availability when and where needed to support JFHP in support of all military activities

Top [JPC-1 IDM] Objectives:

1. Legacy Program Integration (LPI) – handling legacy CHCS/AHLTA data for new Cerner system
2. Integrated Public/ Private Cloud Management – researching cloud migration for MHS systems
3. Interactive Visualization Framework to Support Exploration and Analysis of TBI/PTSD Clinical Data

Vision

Deliver premier Live, Virtual, Constructive and Gaming material solutions across the Military Health System (MHS) as the DOD leader in medical Integrated Training Environments (ITE)

Mission

Develop, Acquire and Sustain Medical Training Aids, Devices, Simulators and Simulations to achieve Medical Readiness

MANAGING PATIENTS

BETTER IN ALL ENVIRONMENTS

PRE-HOSPITAL

MODELING

- *Deployed Healthcare Resource Management*
- *Patient Movement and Tracking*

SIMULATION

- *Point of Injury*
- *Transport (Ground, Air)*
- *Deployed Environment Nodes of Care (Role I, II, III)*

HOSPITAL

MODELING

- *Healthcare Business Processes*
- *Contingency Planning (Ebola, H1N1)*

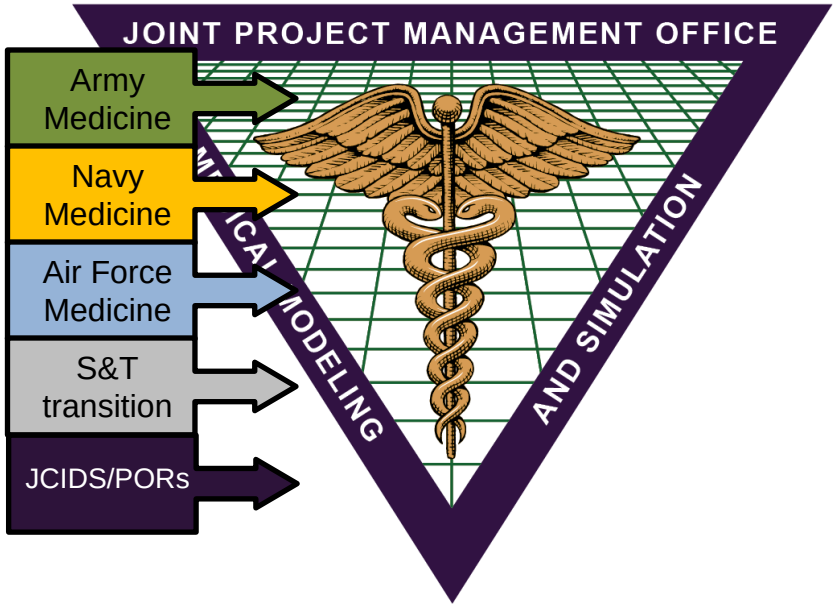
SIMULATION

- *Graduate Medical Education (Residency-Based Simulation)*
- *Hospital Education Program (ACLS, PALS, Infection Control)*
- *Hospital Response*
- *Surgical Skills Development*

MSMPD MILITARY MEDICINE PARTNERSHIP DAYS

The Military Healthcare training environment

Unified in purpose and method



Questions?

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