



**NICoE**   
National Intrepid  
Center of Excellence



# CLINICAL APPROACHES TO TBI AND PTSD: AN UPDATE



# NICoE Overview



**Vision:** The NICoE is an instrument of Hope, Healing, Discovery, and Learning

**Mission:** To be the leader in advancing psychological health and traumatic brain injury treatment, research, and education

- **Clinical:** A model of holistic, interdisciplinary diagnostic and treatment planning in a family focused, collaborative environment which promotes physical, psychological and spiritual healing and is committed to long-term warrior follow-up and family contact
- **Research:** A DoD Institute with a unique patient base and the most current technical and clinical resources for initiating innovative pilot studies designed to advance evaluation and treatment in service members with the complex interaction of TBI and PHI who are not responding to conventional therapy elsewhere in the Military Health System (MHS)
- **Training and Education:** A venue for the dissemination of next generation standards of care and resilience to providers as well as service members and families



# Medical Imperative



- Excess of 300,000 warriors with Traumatic Brain Injury (TBI) and/or Psychological Health Injury (PHI)
- Complex interaction between TBI and PHI resulting in new clinical entity or more virulent form.
- Failure of recovery despite conventional therapy
- Challenge: Identify Pathophysiology, Natural Hx, Diagnostic Tools, Treatment & Disseminate information

**Blast Exposure**



**IED: Improvised Explosive Device**





# Patient Profile



**Active duty service members with a mild to moderate TBI complicated by other impairing PH conditions, who are not responding to conventional therapy and who are having challenges with military duty requirements and interpersonal relationships**

## **The profile of service members who will be seen at the NICoE will include:**

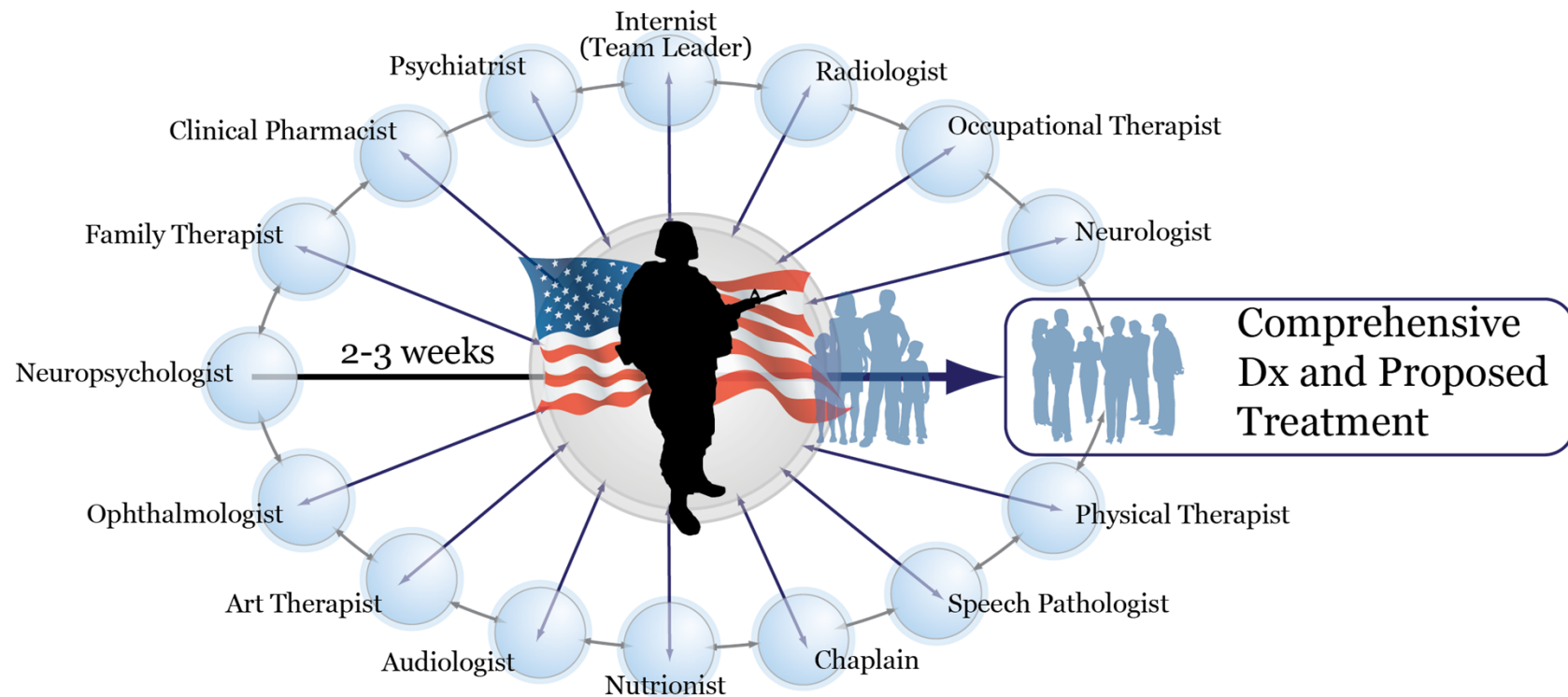
- Active Duty (to include National Guard and Reservists on orders)
- Mild to moderate TBI and Psychological Health conditions (OEF/OIF/OND related)
- Persistence of symptoms despite receiving treatment
- No active/untreated substance abuse disorder (no potential for withdrawal)
- Service Members will be assigned temporary duty to the NICoE on unit funded travel orders as required (lodging at the Fisher House will be provided at no cost to the Service Member)
- Capable of participating in an Intensive Outpatient Level of Care, including:
  - Able to perform all ADLs and live independently in a Fisher House at NNMC
  - Able to independently obtain/provide for their own food, transportation and conduct their own financial affairs
  - Not a danger to self or others
  - Not in need of services requiring a level of nursing care or medical monitoring higher than what can safely be provided in an outpatient setting



# Collaborative, Patient-Centered Evaluation and Assessment

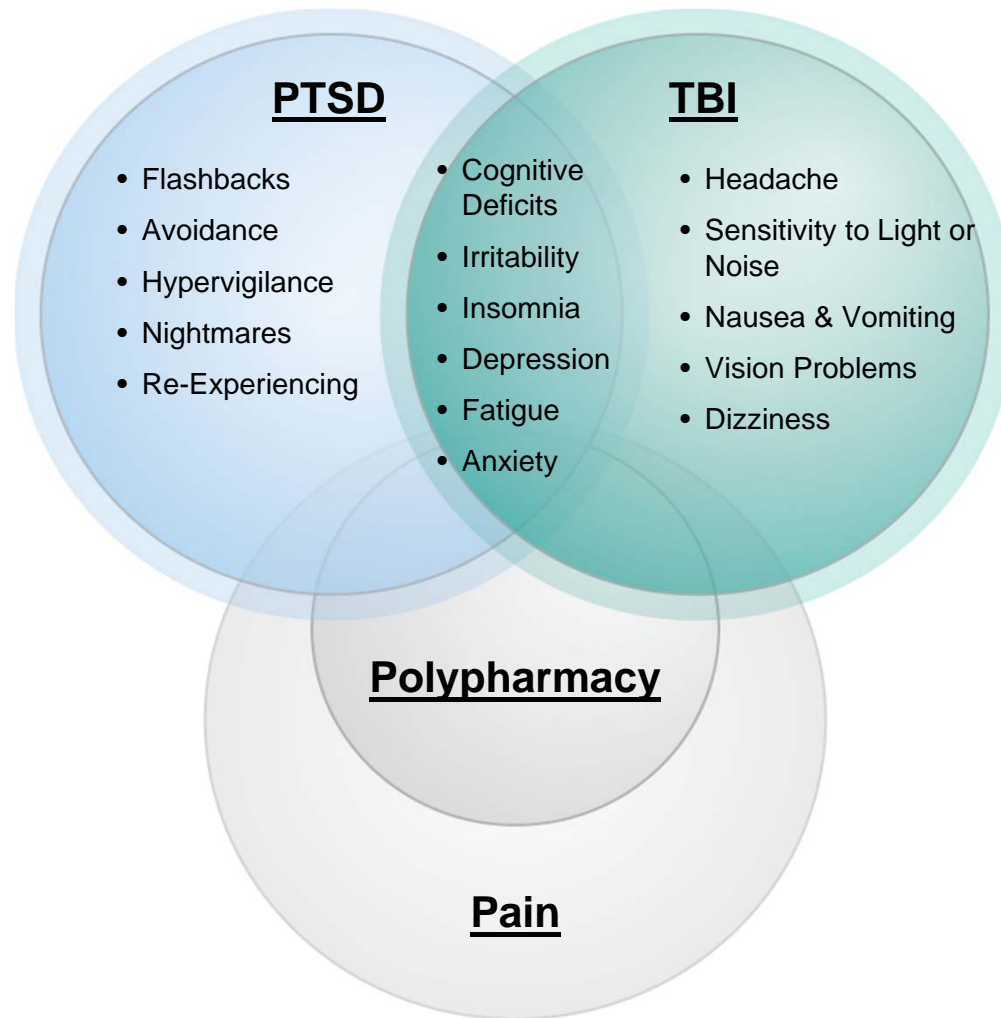


~3 weeks of intensive diagnostics and treatment planning





# Overlap of Symptoms: Challenging Co-morbidity





# Two Guidelines: One Patient



Clinical Practice Guideline

## Management of Concussion/mild Traumatic Brain Injury

April, 2009



VA/DoD Evidence Based Practice

VA/DoD Clinical Practice Guideline

## Management of Post-Traumatic Stress

2010



VA/DoD Evidence Based Practice



# PTSD TREATMENT PSYCHOTHERAPY

## Balance = Benefit - Harm



SR	SUBS.	SOMEWHAT	UN-KNOWN	NONE or HARM
A	<ul style="list-style-type: none"> <li>• Cognitive Therapy [CT]</li> <li>• Exposure Therapy [ET]</li> <li>• Anxiety management</li> <li>• EMDR</li> </ul>			
B		<ul style="list-style-type: none"> <li>• Imagery Rehearsal Therapy [</li> <li>• Psychodynamic Therapy</li> <li>• <b>Adjunctive treatment:</b> <ul style="list-style-type: none"> <li>- Dialectical Behavioral Therapy [DBT]</li> <li>- Hypnosis</li> </ul> </li> </ul>		
C		<ul style="list-style-type: none"> <li>• Patient Education</li> </ul>		
I				
D				





# VA/DoD Clinical Practice Guideline for Management of Post-traumatic Stress Update- 2010



A collage of five VA/DoD Clinical Practice Guideline covers. Each cover features a central image of a caduceus (a staff with two snakes and wings) superimposed on an American flag. The covers are: 1. "Bipolar Disorder" (2001), 2. "Management of Major Depressive Disorder" (2009), 3. "Management of Post-Traumatic Stress" (2010), 4. "Management of Substance Use Disorder" (2002), and 5. "Management of Concussion/mild Traumatic Brain Injury" (2008). Each cover also includes the text "VA/DoD Clinical Practice Guideline" and "VA/DoD Evidence Based Practice".

[www.healthquality.va.gov](http://www.healthquality.va.gov)



# Optimal Healing Environment



## Interdisciplinary, Integrative, Holistic & Family-Based Care In a Model of Hospitality

### Patient Intake Factors

- Poor Military Performance
- Fractured Interpersonal Relations
- Reliance on Substances
- Physical & Mental Pain
- Lack of Empowerment

### NICoE Goals

- Reduce Impairment
- Reduce Disability
- Reduce Suffering
- Provide Tools to Manage Symptoms
- Instill Hope

### Trajectory of Recovery

- Enhanced & Motivated Performance
- Recovering Interpersonal Relations
- Use of Mind/Body Skills
- Reduction in Pain
- Self Management



# Reduce Suffering, Instill Hope, and Address Moral Injury...but How?



Systematically targets specific areas of focus :

- Priority Group 1: ~ Day 1 and throughout program
  - Ensure Safety
  - Improve Sleep
  - Decrease Physical Pain
  - Decrease Psychological Pain
  - Decrease Moral/Ethical Pain
  - Facilitate Positive Use of the Health Care System/Restore Trust in the System
  
- Priority Group 2: ~ Day 1 - 4
  - Intensive/Integrative Diagnoses
  - Decrease Polypharmacy
  
- Priority Group 3:
  - Enhance Self-Management/Self-Efficacy
  - Improve Relationships (family, chain of command, peers)
  - Improve Functional Cognitive Performance
  - Improve Psychosocial Functioning
  - Improve Physical Performance



# Multidisciplinary vs Interdisciplinary

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Multidisciplinary

Interdisciplinary



# Multidisciplinary vs Interdisciplinary



## Multidisciplinary

- Each discipline approaching from own perspective

## Interdisciplinary

- Integrates separate discipline approaches



# Multidisciplinary vs Interdisciplinary



## Multidisciplinary

- Each discipline approaching from own perspective
- Treatment Prescribed to Patient

## Interdisciplinary

- Integrates separate discipline approaches
- Patient intimately involved in discussions and planning



# Multidisciplinary vs Interdisciplinary



## Multidisciplinary

- Each discipline approaching from own perspective
- Treatment Prescribed to Patient
- Systems based care model

## Interdisciplinary

- Integrates separate discipline approaches
- Patient intimately involved in discussions and planning
- Holistic



# Multidisciplinary vs Interdisciplinary



## Multidisciplinary

- Each discipline approaching from own perspective
- Treatment Prescribed to Patient
- Systems based care model
- Patient recipient of plan

## Interdisciplinary

- Integrates separate discipline approaches
- Patient intimately involved in discussions and planning
- Holistic
- Pt empowered to have responsibility in their care





# Holistic Healing at NICoE



Central Park



# Complementary and Alternative Medicine



## VA/DoD PTSD CPG Findings on CAM:

- May facilitate engagement in care
- May be considered for some patients who refuse evidence-based treatments
- Providers should discuss the evidence for effectiveness and risk-benefits of different options, and ensure that the patient is appropriately informed



# CAM Practices



Problem	Nutrition	Exercise	Yoga	Tai Chi/Qigong	Trauma Releasing Exercises	Breathing
Hyperarousal		*	*	*	*	*
Avoidance		*	*	*	*	*
Re-experiencing					*	
Anxiety	*	*	*	*		*
Depression	*	*	*			*
Bereavement						
Guilt						
Hopelessness						
Low self-compassion			*			
Low self-efficacy	*	*	*	*		*
Moral Injury						
Sleep problems	*	*	*			*
Pain	*	*	*			
Tobacco use						*
Increased alcohol use			*			
Misuse of medications						
Polypharmacy		*	*			*
Other high-risk behaviors						
Attention/Concentration						
Memory	*					
Balance		*	*	*		
Cardiovascular/metabolic	*	*	*			
Deconditioning		*	*	*	*	



# CAM Practices



<b>Problem</b>	<b>Rec Therapy</b>	<b>Laughter and Humor</b>	<b>Nature</b>
Hyperarousal		*	*
Avoidance	*	*	
Re-experiencing			
Anxiety	*	*	*
Depression	*	*	*
Bereavement			
Guilt			
Hopelessness		*	
Low self-compassion			
Low self-efficacy	*		
Moral Injury			
Sleep problems			
Pain		*	
Tobacco use			
Increased alcohol use			
Misuse of medications			
Polypharmacy			
Other high-risk behaviors	*		
Attention/Concentration			
Memory			
Balance			
Cardiovascular/metabolic	*		
Deconditioning	*		



# CAM Practices



<b>Problem</b>	<b>Positive psychology</b>	<b>Biofeedback</b>	<b>Neurofeedback</b>
Hyperarousal		*	*
Avoidance			
Re-experiencing			
Anxiety		*	
Depression	*		
Bereavement			
Guilt	*		
Hopelessness	*		
Low self-compassion	*		
Low self-efficacy	*	*	*
Moral Injury			
Sleep problems			
Pain		*	
Tobacco use			
Increased alcohol use			*
Misuse of medications			
Polypharmacy			
Other high-risk behaviors			
Attention/Concentration			*
Memory			
Balance			
Cardiovascular/metabolic			
Deconditioning			



# CAM Practices



<b>Problem</b>	<b>Art Therapy</b>	<b>Music Therapy</b>	<b>Journaling</b>	<b>Bibliotherapy</b>
Hyperarousal		*		
Avoidance	*	*	*	
Re-experiencing	*		*	
Anxiety	*	*	*	*
Depression	*	*	*	*
Bereavement	*	*	*	*
Guilt	*		*	
Hopelessness	*		*	*
Low self-compassion				
Low self-efficacy	*	*		*
Moral Injury	*	*	*	*
Sleep problems		*		
Pain				
Tobacco use				
Increased alcohol use				
Misuse of medications				
Polypharmacy				
Other high-risk behaviors			*	*
Attention/Concentration		*		
Memory				
Balance				
Cardiovascular/metabolic				
Deconditioning				



# CAM Practices



<b>Problem</b>	<b>Acupressure</b>	<b>EFT</b>	<b>CES</b>	<b>Massage</b>
Hyperarousal	*	*	*	*
Avoidance		*		
Re-experiencing		*		
Anxiety	*	*	*	*
Depression	*		*	
Bereavement				
Guilt				
Hopelessness				
Low self-compassion				
Low self-efficacy				
Moral Injury				
Sleep problems	*		*	
Pain	*		*	*
Tobacco use				
Increased alcohol use				
Misuse of medications			*	
Polypharmacy	*		*	*
Other high-risk behaviors				
Attention/Concentration				
Memory				
Balance				
Cardiovascular/metabolic				
Deconditioning				



# CAM Practices



<b>Problem</b>	<b>Other Creative Arts</b>	<b>Spirituality</b>	<b>Acupuncture</b>
Hyperarousal		*	*
Avoidance	*	*	
Re-experiencing	*	*	
Anxiety	*	*	*
Depression	*	*	*
Bereavement	*	*	*
Guilt	*	*	
Hopelessness	*	*	
Low self-compassion			
Low self-efficacy	*		
Moral Injury	*	*	
Sleep problems			*
Pain			*
Tobacco use			*
Increased alcohol use		*	*
Misuse of medications			*
Polypharmacy			*
Other high-risk behaviors			
Attention/Concentration			
Memory			*
Balance			
Cardiovascular/metabolic			
Deconditioning			





# CAM Challenges



- Tools for providers and patients are needed—accurate and unbiased information on CAM is needed
- Promoting evidence-based treatment ultimately enhances and optimizes treatment outcomes, including knowledge of state of the evidence for CAM modalities for PTSD
- Tremendous variability, availability, and dependability in CAM practices



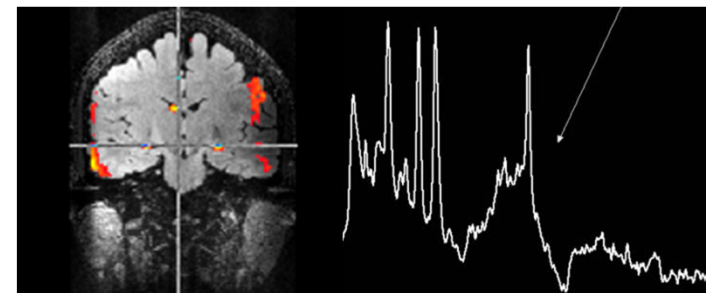
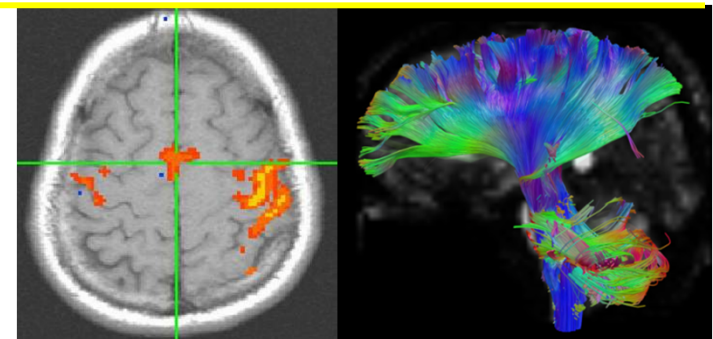
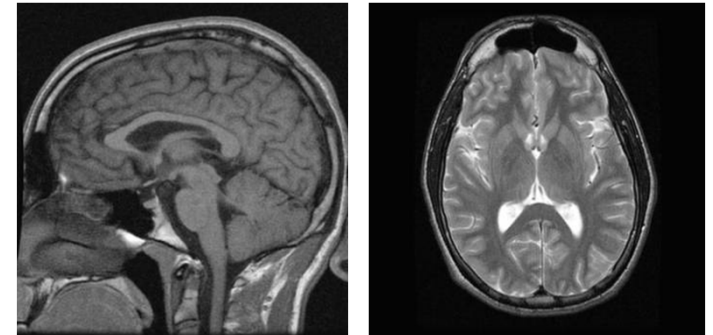
# Questions



# NICOE vs Routine MRI



Study	Image Brain:	Number of images
Routine MRI	Structure	350
NICOE MRI	Structure Function Wiring Chemistry Blood Flow BBB	41,000

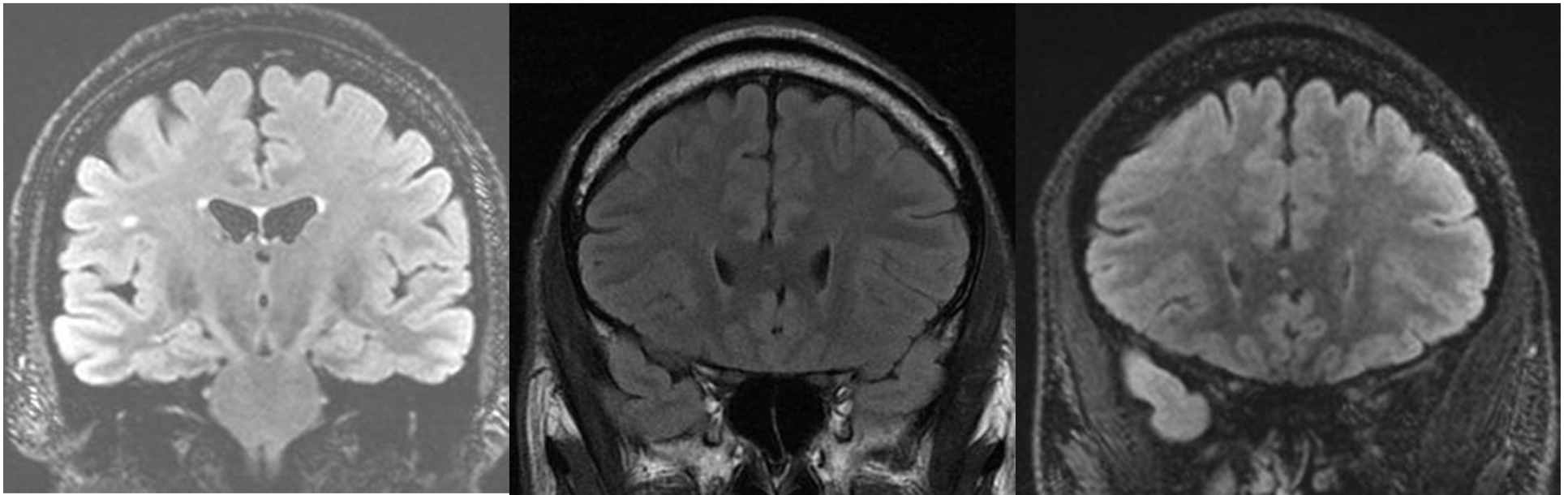




# Initial TBI Findings at NICoE



Patients Imaged with MRI TBI Protocol (10weeks)	Patients with positive findings of TBI	TBI Patients with negative/no prior imaging
44	28 (64%)	23 (82%)



NICoE- 320 images at 1mm  
Normal- 30 images at 5mm



# TBI Microhemorrhage

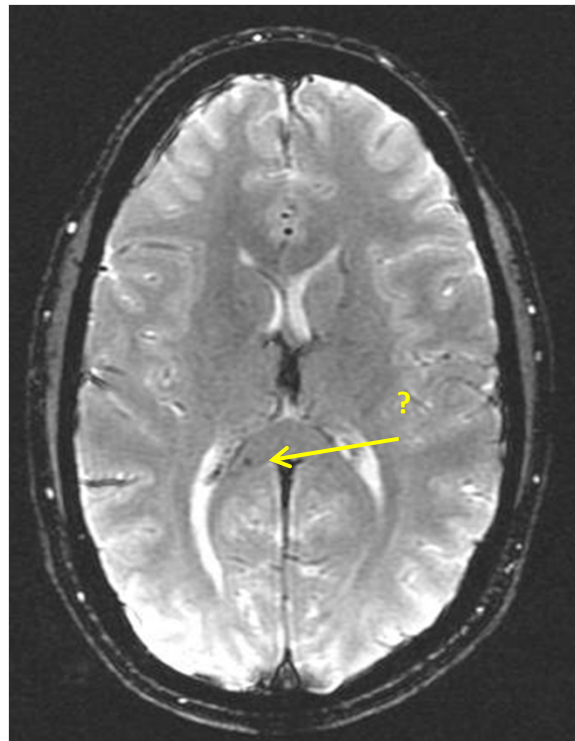


CT



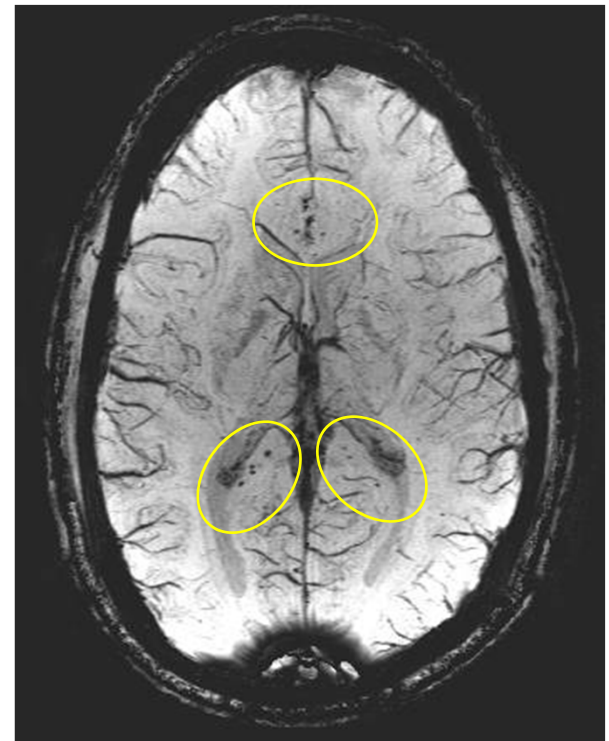
Read as Normal

Routine MRI- GRE



Possible Lesion  
Corpus Callosum

New TBI Study- SWI



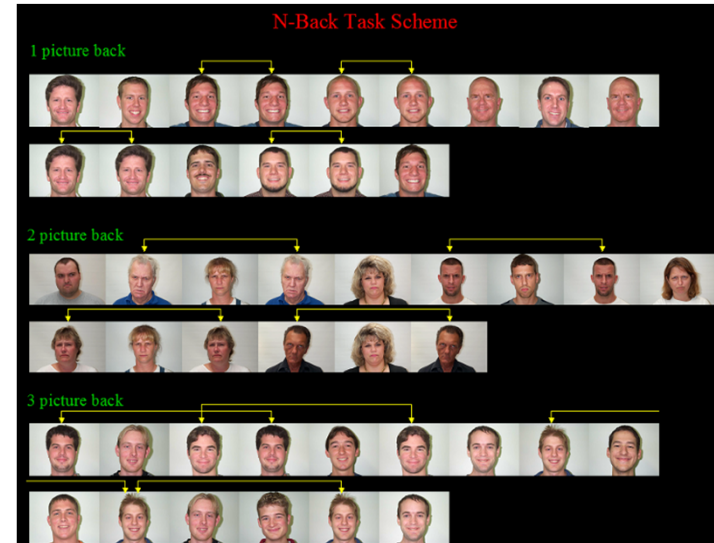
Multiple Lesions Detected



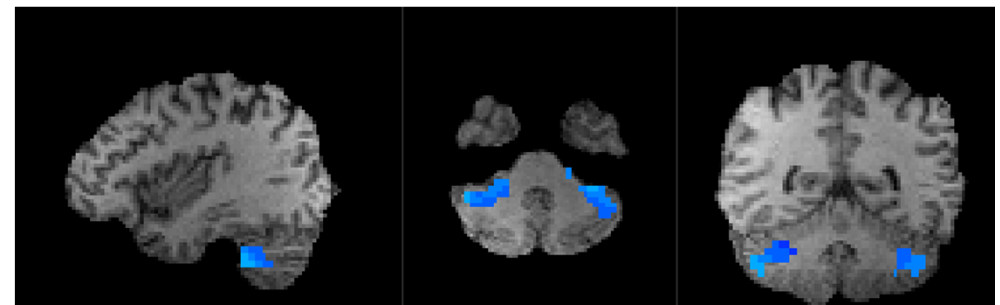
# FMRI



- Resting state
  - (default neural-networks)
- Breath Hold
  - (hemodynamic response)
- Color Stroop
  - (executive function/ inhibition)
- Facial N-Back
  - (working memory/ emotion)



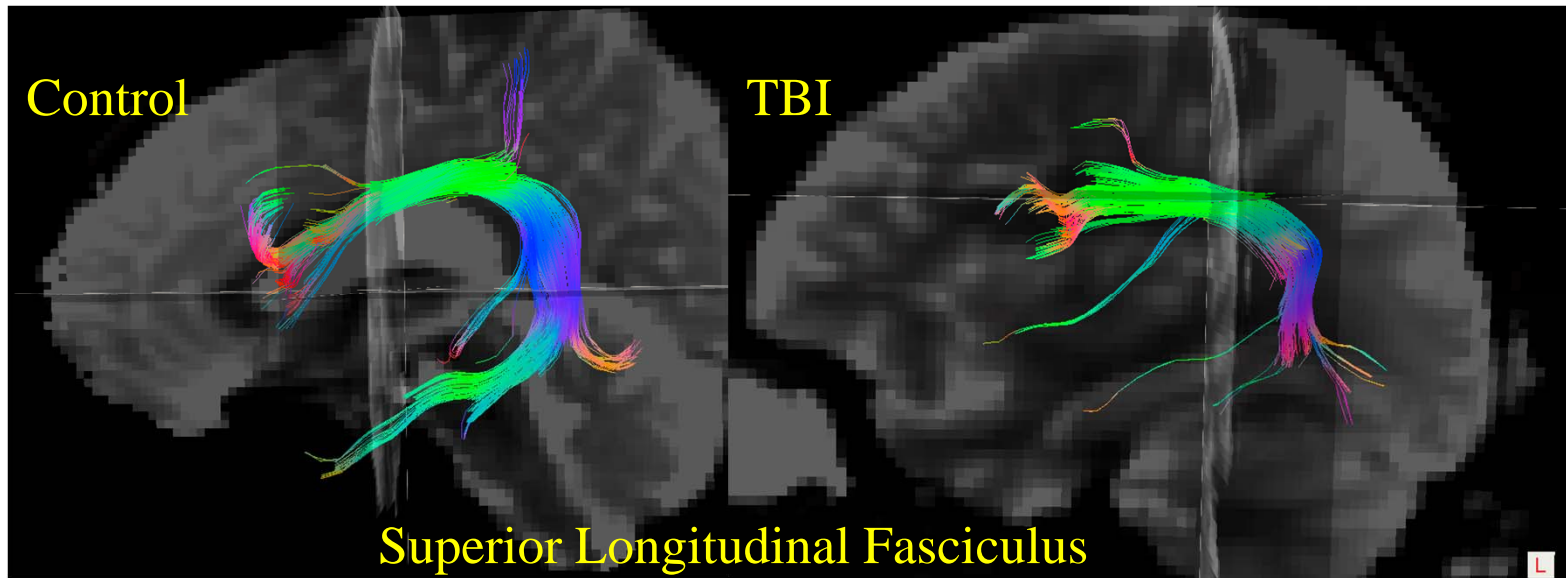
15 TBI and 11 controls- (3back – 1back)



Decreased activation in cerebellum in TBI with increased working memory load



# Diffusion Tensor Imaging (DTI)



- Seeing changes in individual moderate TBI subjects, more subtle results in the grouped analysis of TBI
- Fiber Cluster Segmentation, Probabilistic Tract, Tract Density, Deterministic Tract methods employed
- Hundreds of image processing methods available to analyze DTI images



# Research – PTSD Predictor Study



**Conducted By:** Col. Michael Roy, M.D., M.P.H., Director, Division of Military Medicine, Professor of Medicine, Uniformed Services University, Bethesda, Md  
**Funded By:** Center for Neuroscience and Regenerative Medicine at USUHS

## ➤ Study Rational:

- Many don't endorse symptoms in initial "honeymoon" period
- Symptoms evolve or are manifest over time after return
- Treatment of full-blown disorders often ineffective or insufficient, return to duty uncommon
- Early identification and intervention may prove more effective

## ➤ Study Aims:

- Comprehensive Baseline Assessment of 128 fairly healthy SMs within 6 weeks after deployment to Iraq or Afghanistan
  - Serial follow-up at 3, 6, 12 months
- Identify best predictors of PTSD, Depression and Post Concussive Syndrome (PCS)





# Research – PTSD Predictor Study

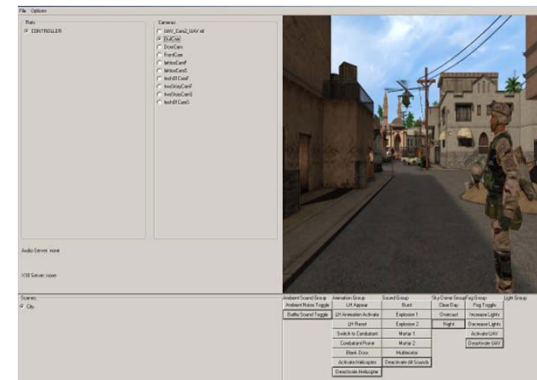
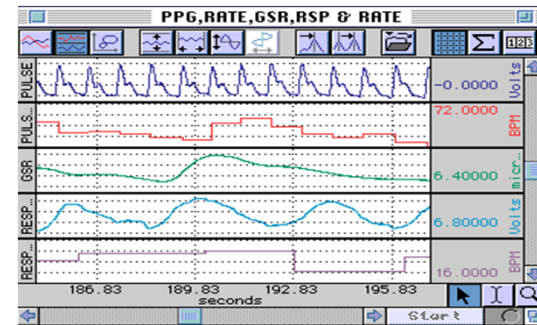


## ➤ Baseline Assessment

- Questionnaires, history and physical exam
- Biomarkers: COMT, 5HTT, DAT, IL-10, S100B, myelin basic protein, neuron-specific enolase
- Catecholamines, cortisol
- Imaging: fMRI & Diffusion Tensor (DTI)
- Brain synchronization assessments
- Olfactory and vestibular function

## ➤ Psychophysiologic Measures

- Baseline measures: HR, BP, RR, SC, HRV, startle
- Same measures in response to Virtual Iraq/Afghanistan
  - Two 5-minute sequences: desert convoy, urban environment including streets and building interiors
- Stimulus generalization





# Research – PTSD Predictor Study



## ➤ Outcome measures

- Primary dependent variables: diagnosis of PTSD, PCS or depression (lumped as “neurocognitive dysfunction”) at any point
  - Clinician Administered PTSD Scale (CAPS)
  - PHQ-9 for depression
  - ICD-10 criteria for PCS
- Regression analysis to identify most promising predictors of neurocognitive dysfunction



# Research – Virtual Reality Study



**Conducted By:** JoAnn Difede, Ph.D., Weill Cornell Medical College; Albert 'Skip' Rizzo, Ph.D., USC Institute for Creative Technologies; Barbara Rothbaum, Ph.D., Emory University School of Medicine; Chris Reist, M.D., Long Beach VA; Col. Michael Roy, M.D., NICoE  
**Funded By:** US Army Medical Research and Materiel Command

## ➤ Research Hypotheses

- DCS will augment response to exposure therapy (VRE and PE) on PTSD symptoms more than placebo augmentation
- VRE will be associated with more improvement than PE
- There will be an interaction between DCS and mode of exposure therapy
- Genetic biomarker BDNF SNP (Val66Met) will moderate response to DCS
- Psychophysiological responses to standardized tasks will predict response to PTSD treatment



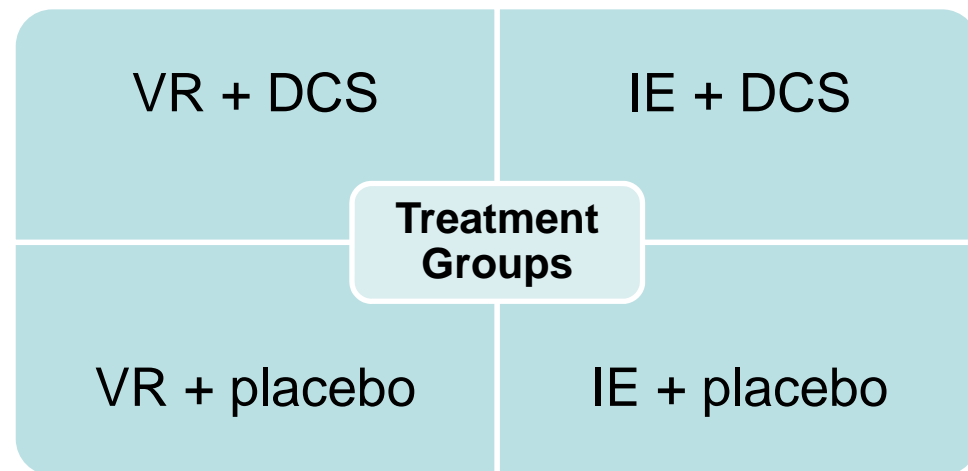
# Research – Virtual Reality Study



## ➤ Treatment Design Overview

- Randomized, controlled clinical trial
- 100 subjects each in DC, NYC, & LA
- 2 x 2 design, 4 active treatment conditions:
  - VRE or IE protocol
  - 50 mg D-Cycloserine (DCS) or placebo
- 9 weekly sessions, including 7 exposure therapy sessions
- Genotyping for the BDNF SNP (Val66Met) by standard PCR methods from saliva samples
- Psychophysiological assessment including laboratory startle assessment and fear conditioning

- ## ➤ Treatment Design –
- All participants receive an active, effective treatment





# Summary



## A “resource” for TBI/PTS/PH capability in the DoD

- A Institute for Integrated Health and Medicine dedicated to research, diagnosis, and treatment of military personnel suffering from Traumatic Brain Injury (TBI), Post Traumatic Stress (PTS) and Psychological Health (PH) conditions
- Military COC incorporating renown civilian and military clinical prowess in research, patient treatment, and collaboration
- This care complements with the sphere of inpatient behavioral health and trauma syndromes as well as the continuum of out-patient care
- A collaborative and innovative DOD center of gravity for TBI/PTS/PH Research and Education; leveraging the best progressive research and advancement throughout the academic, private and military sectors
- Leveraging one of the world's most aesthetically designed buildings as a signal of hope and commitment to all who walk through its doors.