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14. ABSTRACT

The purpose of this study is to determine the agreement between the CDC definition and the clinical judgment of a board-certified neurologist based upon medical records review, and to utilize a historical prospective design in a large, well documented population to determine possible performance and health decrements among US service members who have a diagnosis of mild traumatic brain injury (mTBI). The scope of this study includes all active duty US Air Force men and women who served for six or more months during October 1, 2001 – December 31, 2007. Analyses are just beginning at this time. However, preliminary data suggest this study will include over 540,000 Airmen with approximately 2-3% who meet the CDC definition for mTBI. The results of this study will be important in understanding possible adverse performance and health decrements associated with mTBI.

15. SUBJECT TERMS
Military personnel, Brain injury, Epidemiology, Mental disorders

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INTRODUCTION: Currently, very little is known regarding changes in neurophysiological state of those with mTBI. This is an important research area because TBI is considered the "signature injury" associated with the Global War on Terror. Although mTBI is most often associated with improvised explosive devices, mTBI can be caused by a host of other means, including occupational mishaps, sports, and motor vehicle accidents. These events and others, contributed to over 44,000 outpatient medical visits for trauma to the head among Airmen during the years 1998-2007. During 2007, approximately 18 Airmen per 1,000 were treated for head trauma, an approximate 3-fold increase from 5 per 1,000 reported during 1998. With an increasing number of Airmen sustaining head trauma, it becomes increasingly more important to understand how this trauma impacts cognitive performance through potential adverse effects on the neurophysiological state.

BODY:

The statement of work (SOW) is found in Appendix 1. According to this SOW, we had anticipated local IRB approval by month 6, approximately March 2009. IRB approval was not obtained until 2 June 2009.

According to the SOW, the Wright-Patterson Medical Center Validation Sub-study was to begin in month 7 (April), but was not actually started until June. However, Task 1, cohort assembly was completed in June and forwarded to the Wright-Patterson Medical Center in June. As of 30 July, the records had been pulled, but not yet copied. It is anticipated that records should be copied by approximately 15 August. While awaiting the results of the Wright-Patterson Medical Center Validation Sub-study, data acquisition and cohort assembly has been completed for the Full Cohort Study (Task 1). Preliminary findings include over 540,000 Airmen with approximately 2-3% meeting the Centers for Disease Control and Prevention (CDC) Administrative data definition for surveillance or research.[1] Analyses will commence promptly at the conclusion of the Wright-Patterson Medical Center Validation Sub-study.

KEY RESEARCH ACCOMPLISHMENTS: N/A, study is in preliminary stages.

REPORTABLE OUTCOMES:

- Poster presentation, 2009 Military Health Research Forum

CONCLUSION: This study started several months behind schedule as a result of IRB processes. The Wright-Patterson Medical Center Validation Sub-study is in progress as well as the Full Cohort Study. Preliminary findings include over 540,000 Airmen with approximately 2-3% whom meet the CDC definition for mTBI. Results from these studies are expected to:

- Determine the agreement between the CDC definition and the clinical judgment of a board-certified neurologist based upon medical records review.
- Utilize a historical prospective design in a large, well documented population to determine the relation between mTBI and mental disorders including depression, PTSD, anxiety disorders, sleep disorders, fatigue, headache, and dementias.
- Evaluate the association between mTBI and neurodegenerative conditions including Alzheimer's disease, Parkinson's disease, Amyotrophic Lateral Sclerosis, and epilepsy.
- Evaluate the association between mTBI and endocrine dysfunction, particularly hypothyroidism, impaired glucose tolerance, impaired fasting glucose, new onset diabetes mellitus and insipidus, pituitary disorders, adrenal disorders, and sex hormone disorders.
- Determine the association between mTBI and measures of social functioning and well-being to include: retention, disability, promotion, risk for mishaps, and health status.

REFERENCES:

1. National Center for Injury Prevention and Control. *Report to Congress on Mild Traumatic Brain Injury in the United States: Steps to Prevent a Serious Public Health Problem*. Atlanta, GA: Centers for Disease Control and Prevention; 2003.

APPENDICES:

1: Statement of Work

2: Military Health Research Forum Poster

Appendix 1. Statement of Work, Award No. 08-M-8089

Task	Month																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1. IRB approval	■	■	■	■	■	■																		
2. Annual report												■												
3. Final report																								■
1. Assemble cohort for review							■																	
2. Review records							■	■																
3. Perform analysis								■																
4. Draft report									■															
1. Data Acquisition							■																	
2. Preliminary analysis								■	■	■	■													
3. Final analysis												■	■	■	■									
4. Draft manuscript															■	■	■							
1. Data Acquisition							■	■	■	■	■													
2. Preliminary analysis												■	■	■	■									
3. Final analysis																■	■	■	■					
4. Draft manuscript																			■	■	■			
1. Data Acquisition												■	■	■										
2. Preliminary analysis															■	■	■	■						
3. Final analysis																			■	■	■	■		
4. Draft manuscript																						■	■	■

Appendix 2, MHRF Poster, Award No. 08-M-8089

Is Mild Traumatic Brain Injury Associated with Decreased Warfighter Performance?

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Abstract

Background: Traumatic brain Injury (TBI) is a concern for US military personnel serving in Iraq and Afghanistan. Additionally, US servicemen and women are at risk for TBI of varying levels of severity as a result of motor vehicle accidents, sports injuries, and other causes. The scientific literature is replete with descriptions of the long-term sequelae of moderate to severe TBI, but little is known regarding potential long-term adverse performance decrements associated with mild TBI (mTBI). The objectives of this study are to determine if mTBI is associated with a number of biological indicators that may adversely affect warfighter performance. This study is funded by the Defense Center of Excellence for Psychological Health and Traumatic Brain Injury

Methods: A historical prospective study will be conducted utilizing electronically-recorded demographic and military-specific data for all US Air Force (USAF) service members (Airmen) who served on active duty for six months or more during the time period of October 1, 2001 – September 30, 2008. A sub-study analysis will be performed on Airmen who suffered a reportable mishap utilizing data from the USAF Safety Center, and an additional sub-study will utilize Veteran's Health Administration (VHA) data. Airmen diagnosed with an mTBI will be identified using International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes published by the Centers for Disease Control and Prevention (CDC) in a 2003 report to Congress. Outcomes include electronically recorded ICD-9-CM diagnoses of selected psychiatric, neurological, and endocrine disorders. A validation study will be conducted examining the accuracy of the CDC mTBI case definition against medical records. Cox proportional hazards modeling will be used to calculate hazard ratios while controlling for varying lengths of follow-up and potentially confounding variables.

Conclusions: TBI may significantly contribute to decreased warfighter performance among US Service men and women. This study will utilize electronically-recorded data from a cohort of active duty Airmen to provide a better understanding of possible outcomes associated with mTBI that may adversely affect warfighter performance.

Impact: A study of the underlying sequelae that may adversely affect the physiological component of warfighter performance will assist those conducting enhanced cognition research to understand the human response to mTBI as a stressor.

Background

- **mTBI is an important concern among US service members who are exposed to such hazards as blast injuries, sports injuries, and trauma associated with motor vehicle accidents**
- **It is believed that brain trauma may lead to long-term mechanical and biomechanical damage that can negatively impact the performance of US service members**
- **The US Military affords the opportunity to study potential long-term performance decrements associated with mTBI**

Objectives

- **To determine the agreement between the CDC administrative data definition of mTBI for surveillance or research and medical records review by a clinical neurologist**
- **To determine the relation between mTBI and select mental disorders, neurodegenerative conditions, and endocrine dysfunctions**
- **To determine the association between mTBI and measures of performance and social functionality**

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Methods

- **Compare Airmen with and without mTBI who served on active duty between Oct 1, 2001- Sep 30, 2008**
- **Exclude those with moderate & severe TBI along with those diagnosed with an mTBI and those with a diagnosis of the outcome of interest within 2 years prior to entrance into the study**
- **Data will be obtained from the Defense Manpower Data Center, the Military Health System, the Air Force Safety Automated System (AFSAS), and selected Department of Veterans Affairs databases**
- **Validate CDC administrative data definition of mTBI for surveillance and research against medical records review by a blinded neurologist co-investigator**
- **Primary study outcomes include:**
  - **Mental disorders: Cognitive disorders, psychotic disorders, mood disorders, anxiety disorders, substance use disorders, impulse control disorders, sleep disorders, adjustment reactions, headaches, fatigue**
  - **Neurological outcomes: Alzheimer's disease, epilepsy and seizure disorders, Parkinson's disease, amyotrophic lateral sclerosis**
  - **Endocrinological outcomes: type II diabetes mellitus, diabetes insipidus, thyroid disorders, adrenal disorders, pituitary disorders, sex hormone disorders**

Methods (cont.)

- **Ground safety sub-study will utilize data from the AFSAS and allow the use of an injured comparison group to study association between mTBI and mental disorders, and to additionally assess the risk for further injury during the follow-up period**
- **VA data will be used to study the relation between mTBI and disability, as well as conditions that may have long onset, such as selected dementias**
- **Statistical analyses:**
  - **Chi-square, and t-tests for univariate associations**
  - **Multivariable analyses utilize Cox proportional hazards modeling to adjust for possible confounding variables and differences in lengths of observation.**

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Discussion

- **Analyses are ongoing at this time**
- **mTBI may significantly contribute to decreased warfighter performance among US Service men and women.**
- **This study will be one of the first to utilize electronically-recorded data from a number of sources to better understand how mTBI may adversely impact warfighter performance**