TBI-BH ECHO

Traumatic Brain Injury – Behavioral Health ECHO

UW Medicine | Psychiatry and Behavioral Sciences

TBI and Suicidality

Lisa A. Brenner, Ph.D., ABPP (Rehabilitation)

Professor

University of Colorado, Anschutz Medical Campus

UW Medicine
UW SCHOOL OF MEDICINE

Project ECHO

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Speaker disclosures

✓ Dr. Brenner reports grants from the VA, DOD, NIH, and the State of Colorado, editorial remuneration from Wolters Kluwer and the Rand Corporation, and royalties from the American Psychological Association and Oxford University Press. In addition, she consults with sports leagues via her university affiliation. She has no specific COIs to report.

The following series planners have no conflicts of interest:

- ✓ Jennifer Erickson DO
- ✓ Jess Fann MD
- ✓ Cherry Junn MD
- ✓ Chuck Bombardier PhD
- ✓ Cara Towle MSN RN MA
- ✓ David Minor
- ✓ Amanda Kersey PhD
- ✓ Lauren Miles

Objectives

Individuals will learn about:

1. Criteria for TBI
2. Mental health conditions frequently co-morbid with TBI
3. Treatment strategies for those with a history of TBI

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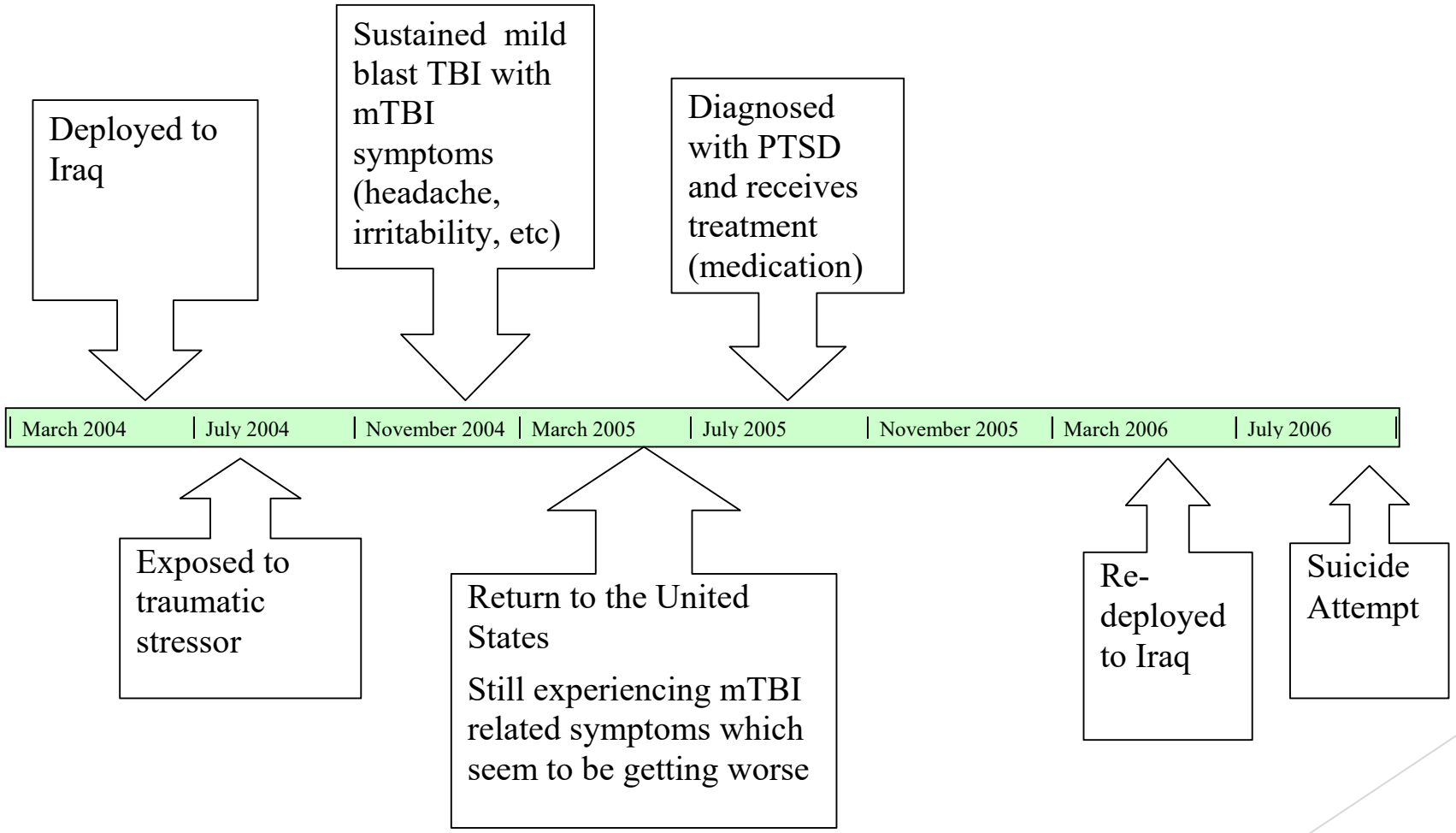
"I think it took awhile before I realized and then when I started thinking about things and realizing that I was going to be like this for the rest of my life, it gives me a really down feeling and it makes me think like—why should I be around like this for the rest of my life?"

- VA Patient/TBI Survivor

Case Presentation

A 55-year-old male seeks assistance from their primary care provider for a history of headaches, dizziness, sleep disturbance, and ”feeling stressed”. The individual recently lost their job as a federal employee. He reports a history of military service with deployments to Iraq. Mr. Jones also notes a history of one suicide attempt and multiple mild TBIs. The first TBI he sustained was in high school while playing football.

Case Example: mTBI and PTSD



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Background

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Traumatic Brain Injury

A bolt or jolt to the head or a penetrating head injury that disrupts the function of the brain. Not all blows or jolts to the head result in a TBI. The severity of such an injury may range from “mild” **(a brief change in mental status or consciousness)** to “severe” **(an extended period of unconsciousness or amnesia)** after the injury. A TBI can result in short- or long-term problems with independent function.

CDC 2005

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Traumatic Brain Injury - Severity

Table 1. Classification of TBI Severity [3]

(If a patient meets criteria in more than one category of severity, the higher severity level is assigned)			
Criteria	**Mild**	**Moderate**	**Severe**
Structural imaging	Normal	Normal or abnormal	Normal or abnormal
Loss of Consciousness (LOC)	0-30 min	>30 min and <24 hours	>24 hours
Alteration of consciousness/ mental state (AOC)*	up to 24 hours	>24 hours; severity based on other criteria	
Posttraumatic amnesia (PTA)	0-1 day	>1 and <7 days	>7 days
Glasgow Coma Scale (GCS) (best available score in first 24 hours)**	13-15	9-12	<9

*Alteration of mental status must be immediately related to the trauma to the head. Typical symptoms would be looking and feeling dazed and uncertain of what is happening, confusion, and difficulty thinking clearly or responding appropriately to mental status questions, and being unable to describe events immediately before or after the trauma event.

**In April 2015, the DoD released a memorandum recommending against the use of GCS scores to diagnose TBI. See the memorandum for additional information.[3]

Department of Veterans Affairs 2021

Military versus Civilian

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Objective

- Describe lifetime history of TBI in Active Duty Soldiers returning from deployment to Afghanistan and/or Iraq

Rehabilitation Psychology

2019, Vol. 64, No. 4, 398–408
http://dx.doi.org/10.1037/rep0000286

Characterization of Lifetime TBIs in a Cohort of Recently Deployed Soldiers: The Warrior Strong Study

Lisa M. Betthauser
VA Rocky Mountain Mental Illness Research Education and Clinical Center, Aurora, Colorado, and University of Colorado, Anschutz Medical Campus

Rachel Sayko Adams
Brandeis University and VA Rocky Mountain Mental Illness Research Education and Clinical Center, Aurora, Colorado

Trisha A. Hostetter
VA Rocky Mountain Mental Illness Research Education and Clinical Center, Aurora, Colorado

Ann I. Scher
Uniformed Services University

Karen Schwab
The Defense and Veterans Brain Injury Center, Silver Spring, Maryland, and Uniformed Services University

Lisa A. Brenner
VA Rocky Mountain Mental Illness Research Education and Clinical Center, Aurora, Colorado, and University of Colorado, Anschutz Medical Campus

Objective: To describe and characterize the lifetime history of traumatic brain injury (TBI) among active duty soldiers returning from deployment to Afghanistan or Iraq. ***Method:*** Data were extracted from a larger parent study that was conducted at two large United States Army bases between 2009 and 2014 during Post-Deployment Health Assessment. The sample included 1,060 soldiers who sustained at least one TBI during their lifetime. ***Results:*** The Ohio State University TBI-Identification Method interview was administered to characterize individuals' total lifetime history of TBI. Soldiers reported sustaining a median of 2 lifetime TBIs. Slightly more than half of the sample without a most recent deployment-related TBI still reported a history of a lifetime TBI (some of which occurred during previous deployments). Most lifetime injuries reported were of mild severity; however, 6% of individuals reported a history of moderate/severe TBI. Blast was the most frequent mechanism associated with recent deployment-related mild TBIs. ***Conclusion:*** Findings suggest that soldiers who screened positive, as well as those who screened negative, for a history of TBI during their recent deployment still endorsed a lifetime history of TBI. Future research is needed to explore the functional impact of multiple TBIs over one's lifetime to help inform screening, assessment, and treatment among military personnel.

Impact and Implications
Although soldiers in this sample mostly reported mild traumatic brain injuries (TBIs), 6% of individuals reported lifetime moderate to severe TBIs. Moreover, a number of soldiers reported a history of nondeployment TBIs. A history of such injuries may contribute to persistent post-TBI symptoms, as well as postmilitary functional challenges. Additional research to investigate the timing, severity, and history of multiple TBIs on short- and long-term outcomes is indicated.

Keywords: traumatic brain injury, lifetime history, deployment, soldiers, OEF/OIF

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Participant Level Data

	Total Sample	BTBIS +/OSU +	BTBIS -/OSU +
Characteristic	n (%)		
Number of Reported TBIs			
1	432 (41%)	161 (32%)	271 (49%)
2	252 (24%)	112 (22%)	140 (25%)
3	169 (16%)	100 (20%)	69 (12%)
4	100 (9%)	58 (11%)	42 (8%)
5	51 (5%)	35 (7%)	16 (3%)
6+	56 (5%)	39 (8%)	17 (3%)

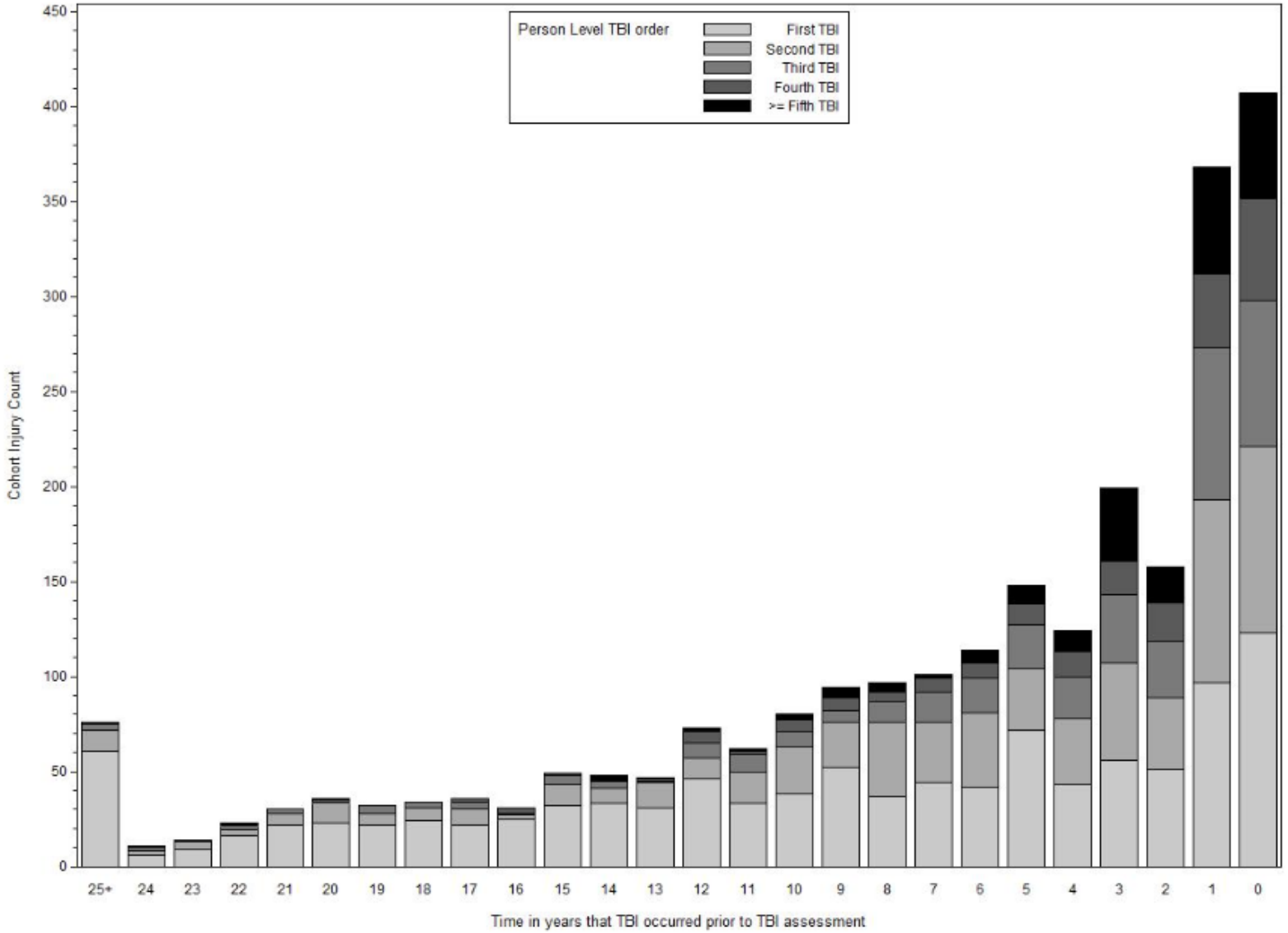
Many who screened negative for TBI had a positive lifetime history of TBI

Lifetime TBI's

BTBIS +/OSU + (Person n=505) 2.7 (mean)

BTBIS -/OSU + (Person n=555) 2.0 (mean)

Total Sample (Person n = 1060) Median for both groups was 2


Person Level TBI order
First TBI
Second TBI
Third TBI
Fourth TBI
>= Fifth TBI
Cohort Injury Count
450
400
350
300
250
200
150
100
50
0
25+
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Time in years that TBI occurred prior to TBI assessment

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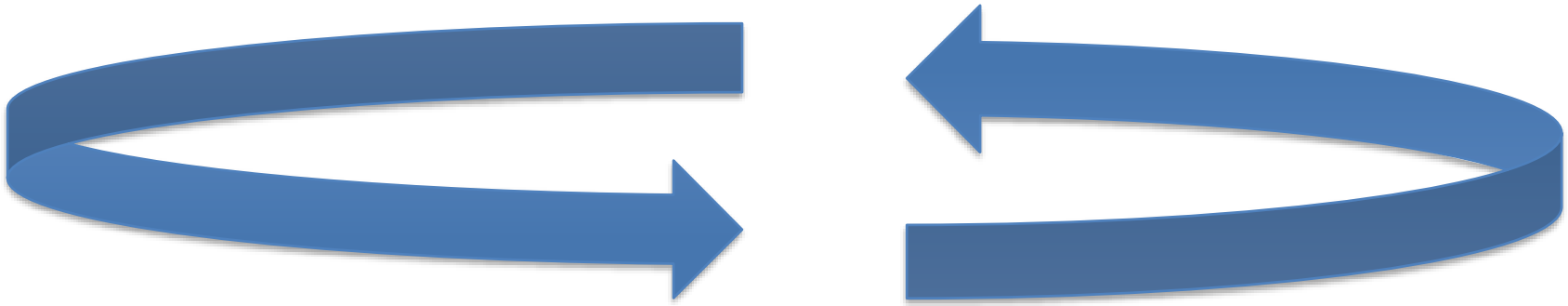
Brain Health: Exposures

Mental Health Conditions*

Psychological Exposures



Traumatic Brain Injuries

Physical Exposures

*Including Alcohol and Substance Misuse

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Increased Rates of Mental Health Conditions in those with mTBI

Article

The Psychiatric Sequelae of Traumatic Injury

Richard A. Bryant, Ph.D.
Meaghan L. O'Donnell, Ph.D.
Mark Creamer, Ph.D.
Alexander C. McFarlane, M.D.
C. Richard Clark, Ph.D.
Derrick Silove, M.D.

Objective: Traumatic injury affects millions of people each year. There is little understanding of the extent of psychiatric illness that develops after traumatic injury or of the impact of mild traumatic brain injury (TBI) on psychiatric illness. The authors sought to determine the range of new psychiatric disorders occurring after traumatic injury and the influence of mild TBI on psychiatric status.

Method: In this prospective cohort study, patients were drawn from recent admissions to four major trauma hospitals across Australia. A total of 1,084 traumatically injured patients were initially assessed during hospital admission and followed up 3 months (N=932, 86%) and 12 months (N=817, 75%) after injury. Lifetime psychiatric diagnoses were assessed in hospital. The prevalence of psychiatric disorders, levels of quality of life, and mental health service use were assessed at the follow-ups. The main outcome measures were 3- and 12-month prevalence of axis I psychiatric disorders, levels of quality of life, and mental health service use and lifetime axis I psychiatric disorders.

Results: Twelve months after injury, 31% of patients reported a psychiatric disorder, and 22% developed a psychiatric disorder that they had never experienced before. The most common new psychiatric disorders were depression (9%), generalized anxiety disorder (9%), posttraumatic stress disorder (6%), and agoraphobia (6%). Patients were more likely to develop posttraumatic stress disorder (odds ratio=1.92, 95% CI=1.08–3.40), panic disorder (odds ratio=2.01, 95% CI=1.03–4.14), social phobia (odds ratio=2.07, 95% CI=1.03–4.16), and agoraphobia (odds ratio=1.94, 95% CI=1.11–3.39) if they had sustained a mild TBI. Functional impairment, rather than mild TBI, was associated with psychiatric illness.

Conclusions: A significant range of psychiatric disorders occur after traumatic injury. The identification and treatment of a range of psychiatric disorders are important for optimal adaptation after traumatic injury.

(Am J Psychiatry 2010; 167:312–320)

Traumatic injury is a common occurrence, with over 2 million people hospitalized in the United States each year following nonfatal injuries (1). Traumatic injury has been shown to be the leading cause of trauma-related psychiatric disorders and hence represents a major public health issue (2, 3). Most attention has focused on the incidence of posttraumatic stress disorder (PTSD) and depression after traumatic injury. Studies indicate that 10%–20% of traumatic injury survivors develop PTSD (4, 5) and 9%–15% develop major depressive disorder (4, 6). Our understanding of the psychiatric impact of traumatic injury has been limited by several factors, however. The focus on PTSD and depression has resulted in a relative neglect of the broad range of psychiatric disorders that can arise after traumatic injury. Some small studies suggest increased rates of anxiety and substance use disorders after traumatic injury (4, 7, 8), but most studies indicate that psychiatric disorders after trauma are typically comorbid with PTSD (9). There remains an outstanding need to evaluate the full range of psychiatric sequelae to traumatic injury.

Another critical issue in the study of traumatic injury has to do with the potential role of mild traumatic brain injury (TBI), which involves transient diminished consciousness following an insult to the brain. Mild TBI represents a major public health issue; the incidence of hospitalized adult patients with mild TBI ranges from 100 to 300/100,000 per year (10). The role of TBI in posttraumatic psychiatric illness has been controversial. Although there is some evidence of comparable rates of PTSD in mild TBI and non-TBI samples (11), some commentators have suggested that impaired consciousness after TBI limits awareness of the traumatic nature of the injury and thus is protective against subsequent PTSD (12). Consistent with this proposal, there is evidence that poorer memory of the traumatic injury after mild TBI is protective against PTSD (13, 14). Several large-scale studies of psychiatric illness associated with TBI have been reported (15–17). For example, based on a large-scale study of 939 health plan members, Fann and colleagues (15) reported that patients with mild TBI were 2.8 times more likely to develop a psychiatric disorder than patients with no TBI. These studies

This article is featured in this month's AJP Audio and is the subject of a CME course (p. 359).

1 year post injury:

- 31% reported psychiatric disorder
- 22% developed new psychiatric disorder

Most common new psychiatric disorders:

- Depression (9%)
- Generalized anxiety disorder (9%)
- Posttraumatic stress disorder (6%)
- Agoraphobia (6%)

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TBI and Depression

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ORIGINAL CONTRIBUTION

Rates of Major Depressive Disorder and Clinical Outcomes Following Traumatic Brain Injury

Charles H. Bombardier, PhD
Jesse R. Fann, MD, MPH
Nancy R. Temkin, PhD
Peter C. Esselman, MD
Jason Barber, MS
Sureyya S. Dikmen, PhD

Context Uncertainties exist about the rates, predictors, and outcomes of major depressive disorder (MDD) among individuals with traumatic brain injury (TBI).

Objective To describe MDD-related rates, predictors, outcomes, and treatment during the first year after TBI.

Design Cohort from June 2001 through March 2005 followed up by structured telephone interviews at months 1 through 6, 8, 10, and 12 (data collection ending February 2006).

Setting Harborview Medical Center, a level I trauma center in Seattle, Washington.

Participants Five hundred fifty-nine consecutively hospitalized adults with complicated mild to severe TBI.

Main Outcome Measures The Patient Health Questionnaire (PHQ) depression and anxiety modules were administered at each assessment and the European Quality of Life measure was given at 12 months.

Results Two hundred ninety-seven of 559 patients (53.1%) met criteria for MDD at least once in the follow-up period. Point prevalences ranged between 31% at 1 month and 21% at 6 months. In a multivariate model, risk of MDD after TBI was associated with MDD at the time of injury (risk ratio [RR], 1.62; 95% confidence interval [CI], 1.37-1.91), history of MDD prior to injury (but not at the time of injury) (RR, 1.54; 95% CI, 1.31-1.82), age (RR, 0.61; 95% CI, 0.44-0.83 for ≥60 years vs 18-29 years), and lifetime alcohol dependence (RR, 1.34; 95% CI, 1.14-1.57). Those with MDD were more likely to report comorbid anxiety disorders after TBI than those without MDD (60% vs 7%; RR, 8.77; 95% CI, 5.56-13.83). Only 44% of those with MDD received antidepressants or counseling. After adjusting for predictors of MDD, persons with MDD reported lower quality of life at 1 year compared with the nondepressed group.

Conclusions Among a cohort of patients hospitalized for TBI, 53.1% met criteria for MDD during the first year after TBI. Major depressive disorder was associated with history of MDD and was an independent predictor of poorer health-related quality of life.

JAMA. 2010;303(19):1938-1945 www.jama.com

TRAUMATIC BRAIN INJURY (TBI) IS a major cause of disability in the United States[1] and a signature injury among wounded soldiers.[2] Assessment and treatment of TBI typically focus on physical and cognitive impairments, yet psychological impairments represent significant causes of disability.[3] Major depressive disorder (MDD) may be the most common and disabling psychiatric condition in individuals with TBI.[4] Poorer cognitive functioning,[5] aggression and anxiety,[6,7] greater functional disability,[6,8] poorer recovery,[9] higher rates of suicide attempts,[10] and greater health care costs[11] are thought to be associated with MDD after TBI.

Despite considerable research, the rates, predictors, and outcomes of MDD after TBI remain uncertain. Depression prevalence rates have ranged from 10% to 77%.[12] Small sample size, selection bias, retrospective reporting, use of measures without diagnostic validity, and failure to exclude patients who were depressed at the time of injury have limited studies of rates and correlates of TBI-related MDD.[13] More definitive studies could galvanize efforts to improve recognition and treatment of this important secondary condition. Therefore, we sought to describe the rate of MDD during the first year after TBI, multivariate predictors of MDD, MDD-related comorbidities, and the relationship of MDD to 1-year quality-of-life outcomes in a large prospectively studied sample of consecutive patients hospitalized for complicated mild to severe TBI.

METHODS

This study was the recruitment phase of a clinical trial investigating the efficacy of sertraline for MDD after TBI. The trial is completed and the outcome analysis is in progress. Eligibility criteria for the cohort study were admission to Harborview Medical Center (a level I trauma center in Seattle, Washington) with TBI and radiological evidence of acute, traumatically induced brain abnormality or Glasgow Coma Scale (GCS) score lower than 13 (based on the lowest score within 24 hours after admission or the first af-

Author Affiliations: Departments of Rehabilitation Medicine (Drs Bombardier, Fann, Temkin, Esselman, and Dikmen), Psychiatry and Behavioral Sciences (Drs Fann and Dikmen), and Neurological Surgery (Drs Temkin and Dikmen and Mr Barber), University of Washington School of Medicine, Seattle; and Departments of Epidemiology (Dr Fann) and Biostatistics (Dr Temkin), University of Washington School of Public Health, Seattle.
Corresponding Author: Charles H. Bombardier, PhD, Department of Rehabilitation Medicine, Box 359612, Harborview Medical Center, 325 Ninth Ave, Seattle, WA 98104 (chb@uw.edu).

During the first year after TBI, 297 of 559 patients (53.1%) met criteria for MDD at least once. The point prevalence of MDD was highest the first month after TBI.

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From: **Rates of Major Depressive Disorder and Clinical Outcomes Following Traumatic Brain Injury**

JAMA. 2010;303(19):1938-1945. doi:10.1001/jama.2010.599

The JAMA Network

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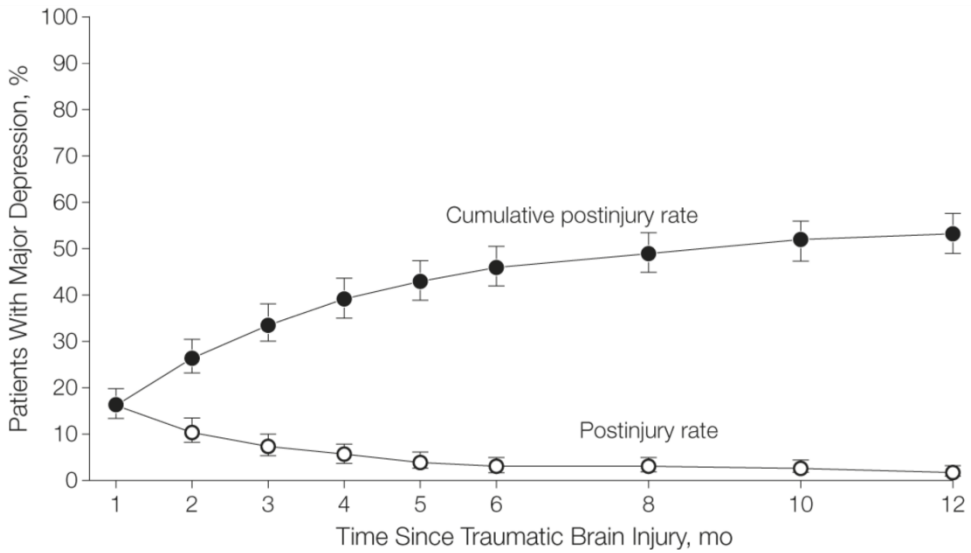

Figure Legend:

Postinjury rate is the proportion of cases ascertained with major depressive disorder for the first time after traumatic brain injury at each assessment. The values underestimate the true rates because not all participants were assessed at each time. Error bars indicate 95% confidence intervals.

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ORIGINAL ARTICLE

Major and Minor Depression After Traumatic Brain Injury

Tessa Hart, PhD, Lisa Brenner, PhD, Allison N. Clark, PhD, Jennifer A. Bogner, PhD, Thomas A. Novack, PhD, Inna Chervoneva, PhD, Risa Nakase-Richardson, PhD, Juan Carlos Arango-Lasprilla, PhD

ABSTRACT. Hart T, Brenner L, Clark AN, Bogner JA, Novack TA, Chervoneva I, Nakase-Richardson R, Arango-Lasprilla JC. Major and minor depression after traumatic brain injury. Arch Phys Med Rehabil 2011;92:1211-9.

Objective: To examine minor as well as major depression at 1 year posttraumatic brain injury (TBI), with particular attention to the contribution of depression severity to levels of societal participation.

Design: Observational prospective study with a 2-wave longitudinal component.

Setting: Inpatient rehabilitation centers, with 1-year follow up conducted primarily by telephone.

Participants: Persons with TBI (N=1570) enrolled in the TBI Model System database and followed up at 1-year postinjury.

Interventions: Not applicable.

Main Outcome Measures: FIM, Patient Health Questionnaire-9, Participation Assessment with Recombined Tools-Objective, Glasgow Outcome Scale-Extended, and the Satisfaction With Life Scale.

Results: Twenty-two percent of the sample reported minor depression, and 26% reported major depression at 1-year post-TBI. Both levels of depression were associated with sex (women), age (younger), preinjury mental health treatment and substance abuse, and cause of injury (intentional). There was a monotonic dose-response relationship between severity of depression and all 1-year outcomes studied, including level of cognitive and physical disability, global outcome, and satisfaction with life. With other predictors controlled, depression severity remained significantly associated with the level of societal participation at 1-year post-TBI.

Conclusions: Minor depression may be as common as major depression after TBI and should be taken seriously for its association to negative outcomes related to participation and quality of life. Findings suggest that, as in other populations, minor and major depression are not separate entities, but exist on a continuum. Further research should determine whether people with TBI traverse between the 2 diagnoses as in other patient groups.

From the Moss Rehabilitation Research Institute, Elkins Park, PA (Hart); VISN 19 Mental Illness, University of Colorado School of Medicine and Craig Hospital, Denver, CO (Brenner); Baylor College of Medicine and TIRR Memorial Hermann, Houston, TX (Clark); Ohio State University, Columbus, OH (Bogner); University of Alabama at Birmingham, Birmingham, AL (Novack); Thomas Jefferson University, Philadelphia, PA (Chervoneva); James A. Haley Veterans Hospital, Tampa, FL (Nakase-Richardson), and University of South Florida, Tampa, FL (Nakase-Richardson); and Virginia Commonwealth University, Richmond, VA (Arango-Lasprilla).

Supported by the National Institute on Disability and Rehabilitation Research (grant nos. H133A070040, H133A070039, H133A070022, H133A070029, H133A070036, and H133A070043).

No commercial party having a direct financial interest in the results of the research supporting this article has or will confer a benefit on the authors or on any organization with which the authors are associated.

Correspondence to Tessa Hart, PhD, Moss Rehabilitation Research Institute, 50 Township Line Rd, Elkins Park, PA 19027, e-mail: *thart@einstein.edu*. Reprints are not available from the author.

0003-9993/11/9208-01028$36.00/0
doi:10.1016/j.apmr.2011.03.005

Key Words: Brain injuries; Depression; Rehabilitation.

TRAUMATIC BRAIN INJURY (TBI) can cause major changes in cognitive, physical, and emotional functioning.[1] Depression, characterized by symptoms including depressed mood, diminished capacity for pleasure, and fatigue, is the most frequently diagnosed psychiatric disorder after TBI.[2] Although estimates vary, the point prevalence rate of major depression after TBI may be greater than 25%[3-5] with a reported period prevalence of 42% to 52% within the first year postinjury.[4,6] A recent study estimated the rate of new depression (ie, excluding those who were depressed at the time of injury) to be 49% in the first year.[7] Although studies differ as to sample size and composition, measures of depression, and measurement interval postinjury, demographic factors generally associated with greater risk of depression after TBI include age, with younger adults at greater risk than older adults,[7,8] and lower levels of education.[7,9] Findings for sex have been mixed: while in some studies women report more depression,[10] as in the general population,[11] in others the pattern is reversed.[9] The presence of premorbid psychiatric problems[10] and premorbid substance abuse[9] have also been cited as predictors. However, severity of injury, as judged by depth or duration of impaired consciousness, does not appear to be related to depression post-TBI.[7,9,12]

Depression after TBI is associated with unfavorable outcomes in many domains of societal participation. Depression has been linked to decreased social activity, community integration, employment, and participation in daily activities after TBI.[1,13] Individuals with TBI and major depression lasting more than 6 months exhibit deterioration in social functioning and performance of activities of daily living.[14] Chronic depression after TBI is also associated with decline in quality of life.[7,15] In a recent study of 100 people followed up to 5-years post-TBI, depression was strongly associated with worse occupational function.[16] Symptoms of depression or anxiety at the time of follow-up predicted interpersonal functioning and independent living status over and above the effects of demographic variables, preinjury psychiatric illness, and injury severity. In this study, similar results were found for both self-reported and proxy-reported outcomes, suggesting that the association was not simply due to self-reported outcomes being

List of Abbreviations

GCS	Glasgow Coma Scale
GOS-E	Glasgow Outcome Scale-Extended
PART-O	Participation Assessment With Recombined Tools-Objective
PHQ-9	Patient Health Questionnaire-9
PTA	posttraumatic amnesia
TBI	traumatic brain injury
TBIMS	Traumatic Brain Injury Model System

Results: Twenty-two percent of the sample reported minor depression, and 26% reported major depression at 1-year post-TBI. Both levels of depression were associated with sex (women), age (younger), preinjury mental health treatment and substance abuse, and cause of injury (intentional). There was a monotonic dose-response relationship between severity of depression and all 1-year outcomes studied, including level of cognitive and physical disability, global outcome, and satisfaction with life. With other predictors controlled, depression severity remained significantly associated with the level of societal participation at 1-year post-TBI.

"For clinicians involved in TBI rehabilitation, the incidence of minor as well as major depression observed in this study highlights the importance of assessing, treating, and (ideally) preventing depression."

Minor depression is diagnosis when 2-4 symptoms of depression persist for at least 2 weeks

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Correspondence to Tessa Hart, PhD, Moss Rehabilitation Research Institute, 50 Township Line Rd, Elkins Park, PA 19027, e-mail: *thart@einstein.edu*. Reprints are not available from the author.

0003-9993/11/9208-01028$36.00/0
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List of Abbreviations

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TBI	traumatic brain injury
TBIMS	Traumatic Brain Injury Model System

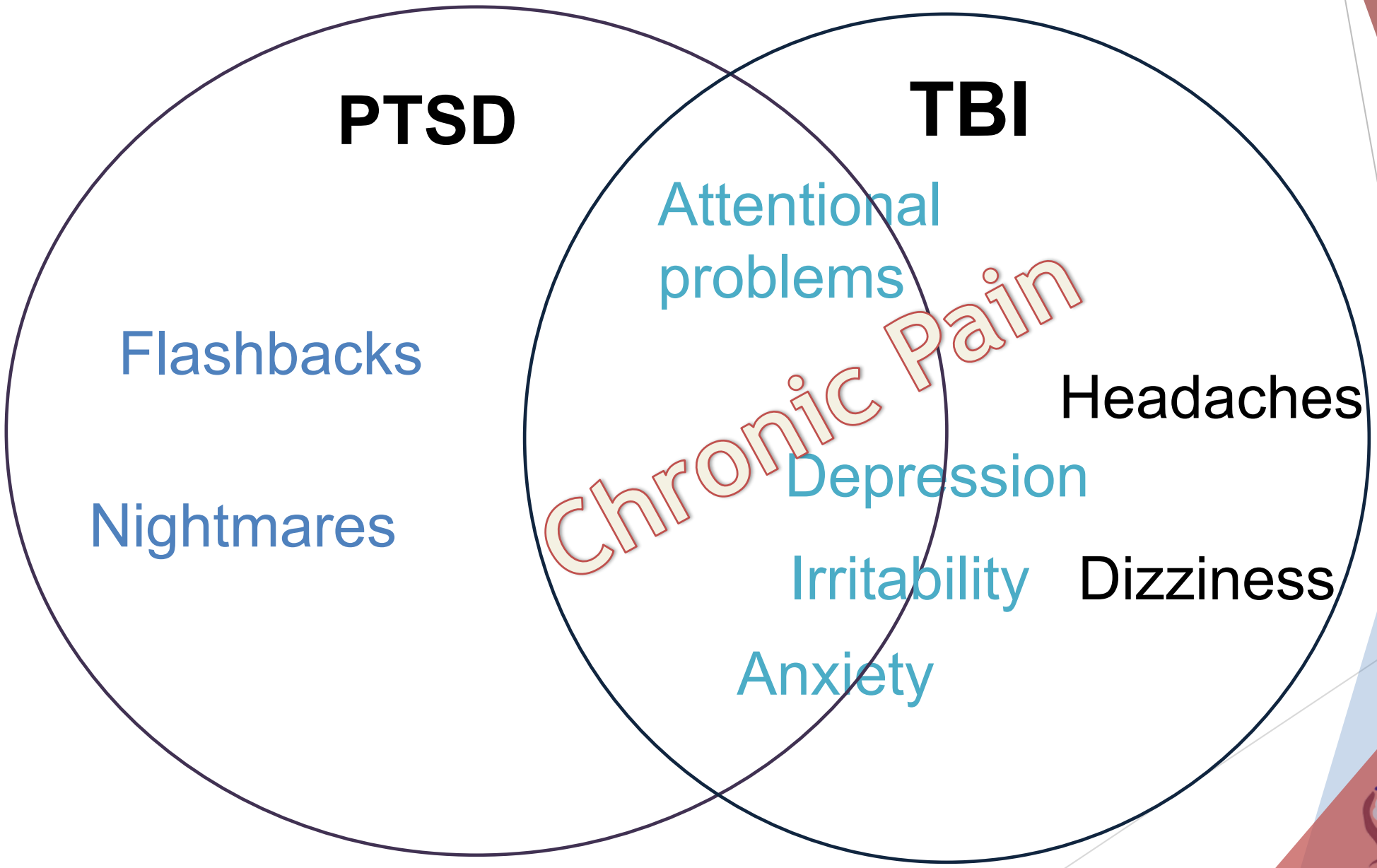
"3/4 of those with MDD at year 1 experienced clinically significant symptoms at year 2"

"…for those with depression at year 1 worsening at year 2 was associated with poor social support…pre-injury mental health issues including SA"

TBI-BH ECHO

TBI and PTSD

TBI-BH ECHO


PTSD
TBI
Attentional problems
Chronic Pain
Flashbacks
Headaches
Depression
Nightmares
Irritability
Dizziness
Anxiety

TBI-BH ECHO

Increased Rates of PTSD in those with mTBI

Article

The Psychiatric Sequelae of Traumatic Injury

Richard A. Bryant, Ph.D.
Meaghan L. O'Donnell, Ph.D.
Mark Creamer, Ph.D.
Alexander C. McFarlane, M.D.
C. Richard Clark, Ph.D.
Derrick Silove, M.D.

Objective: Traumatic injury affects millions of people each year. There is little understanding of the extent of psychiatric illness that develops after traumatic injury or of the impact of mild traumatic brain injury (TBI) on psychiatric illness. The authors sought to determine the range of new psychiatric disorders occurring after traumatic injury and the influence of mild TBI on psychiatric status.

Method: In this prospective cohort study, patients were drawn from recent admissions to four major trauma hospitals across Australia. A total of 1,084 traumatically injured patients were initially assessed during hospital admission and followed up 3 months (N=932, 86%) and 12 months (N=817, 75%) after injury. Lifetime psychiatric diagnoses were assessed in hospital. The prevalence of psychiatric disorders, levels of quality of life, and mental health service use were assessed at the follow-ups. The main outcome measures were 3- and 12-month prevalence of axis I psychiatric disorders, levels of quality of life, and mental health service use and lifetime axis I psychiatric disorders.

Results: Twelve months after injury, 31% of patients reported a psychiatric disorder, and 22% developed a psychiatric disorder that they had never experienced before. The most common new psychiatric disorders were depression (9%), generalized anxiety disorder (9%), posttraumatic stress disorder (6%), and agoraphobia (6%). Patients were more likely to develop posttraumatic stress disorder (odds ratio=1.92, 95% CI=1.08–3.40), panic disorder (odds ratio=2.01, 95% CI=1.03–4.14), social phobia (odds ratio=2.07, 95% CI=1.03–4.16), and agoraphobia (odds ratio=1.94, 95% CI=1.11–3.39) if they had sustained a mild TBI. Functional impairment, rather than mild TBI, was associated with psychiatric illness.

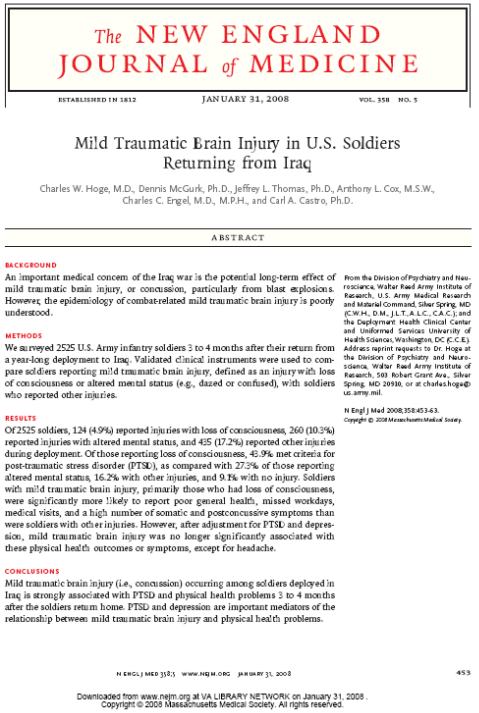
Conclusions: A significant range of psychiatric disorders occur after traumatic injury. The identification and treatment of a range of psychiatric disorders are important for optimal adaptation after traumatic injury.

(Am J Psychiatry 2010; 167:312–320)

Traumatic injury is a common occurrence, with over 2 million people hospitalized in the United States each year following nonfatal injuries (1). Traumatic injury has been shown to be the leading cause of trauma-related psychiatric disorders and hence represents a major public health issue (2, 3). Most attention has focused on the incidence of posttraumatic stress disorder (PTSD) and depression after traumatic injury. Studies indicate that 10%–20% of traumatic injury survivors develop PTSD (4, 5) and 9%–15% develop major depressive disorder (4, 6). Our understanding of the psychiatric impact of traumatic injury has been limited by several factors, however. The focus on PTSD and depression has resulted in a relative neglect of the broad range of psychiatric disorders that can arise after traumatic injury. Some small studies suggest increased rates of anxiety and substance use disorders after traumatic injury (4, 7, 8), but most studies indicate that psychiatric disorders after trauma are typically comorbid with PTSD (9). There remains an outstanding need to evaluate the full range of psychiatric sequelae to traumatic injury.

Another critical issue in the study of traumatic injury has to do with the potential role of mild traumatic brain injury (TBI), which involves transient diminished consciousness following an insult to the brain. Mild TBI represents a major public health issue; the incidence of hospitalized adult patients with mild TBI ranges from 100 to 300/100,000 per year (10). The role of TBI in posttraumatic psychiatric illness has been controversial. Although there is some evidence of comparable rates of PTSD in mild TBI and non-TBI samples (11), some commentators have suggested that impaired consciousness after TBI limits awareness of the traumatic nature of the injury and thus is protective against subsequent PTSD (12). Consistent with this proposal, there is evidence that poorer memory of the traumatic injury after mild TBI is protective against PTSD (13, 14). Several large-scale studies of psychiatric illness associated with TBI have been reported (15–17). For example, based on a large-scale study of 939 health plan members, Fann and colleagues (15) reported that patients with mild TBI were 2.8 times more likely to develop a psychiatric disorder than patients with no TBI. These studies

This article is featured in this month's AJP Audio and is the subject of a CME course (p. 359).



The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JANUARY 31, 2008 VOL. 358 NO. 5

Mild Traumatic Brain Injury in U.S. Soldiers Returning from Iraq

Charles W. Hoge, M.D., Dennis McGurk, Ph.D., Jeffrey L. Thomas, Ph.D., Anthony L. Cox, M.S.W., Charles C. Engel, M.D., M.P.H., and Carl A. Castro, Ph.D.

ABSTRACT

BACKGROUND

An important medical concern of the Iraq war is the potential long-term effect of mild traumatic brain injury, or concussion, particularly from blast explosions. However, the epidemiology of combat-related mild traumatic brain injury is poorly understood.

METHODS

We surveyed 2525 U.S. Army infantry soldiers 3 to 4 months after their return from a year-long deployment to Iraq. Validated clinical instruments were used to compare soldiers reporting mild traumatic brain injury, defined as an injury with loss of consciousness or altered mental status (e.g., dazed or confused), with soldiers who reported other injuries.

RESULTS

Of 2525 soldiers, 124 (4.9%) reported injuries with loss of consciousness, 260 (10.3%) reported injuries with altered mental status, and 435 (17.2%) reported other injuries during deployment. Of those reporting loss of consciousness, 43.9% met criteria for post-traumatic stress disorder (PTSD), as compared with 27.5% of those reporting altered mental status, 16.2% with other injuries, and 9.1% with no injury. Soldiers with mild traumatic brain injury, primarily those who had loss of consciousness, were significantly more likely to report poor general health, missed workdays, medical visits, and a high number of somatic and postconcussive symptoms than were soldiers with other injuries. However, after adjustment for PTSD and depression, mild traumatic brain injury was no longer significantly associated with these physical health outcomes or symptoms, except for headache.

CONCLUSIONS

Mild traumatic brain injury (i.e., concussion) occurring among soldiers deployed in Iraq is strongly associated with PTSD and physical health problems 3 to 4 months after the soldiers return home. PTSD and depression are important mediators of the relationship between mild traumatic brain injury and physical health problems.

From the Division of Psychiatry and Neuroscience, Walter Reed Army Institute of Research, U.S. Army Medical Research and Material Command, Silver Spring, MD (C.W.H., D.M., J.L.T., A.L.C., C.A.C.); and the Deployment Health Clinical Center and Uniformed Services University of Health Sciences, Washington, DC (C.C.E.). Address reprint requests to Dr. Hoge at the Division of Psychiatry and Neuroscience, Walter Reed Army Institute of Research, 503 Robert Grant Ave., Silver Spring, MD 20910, or at charles.hoge@us.army.mil.

N Engl J Med 2008;358:453-63.

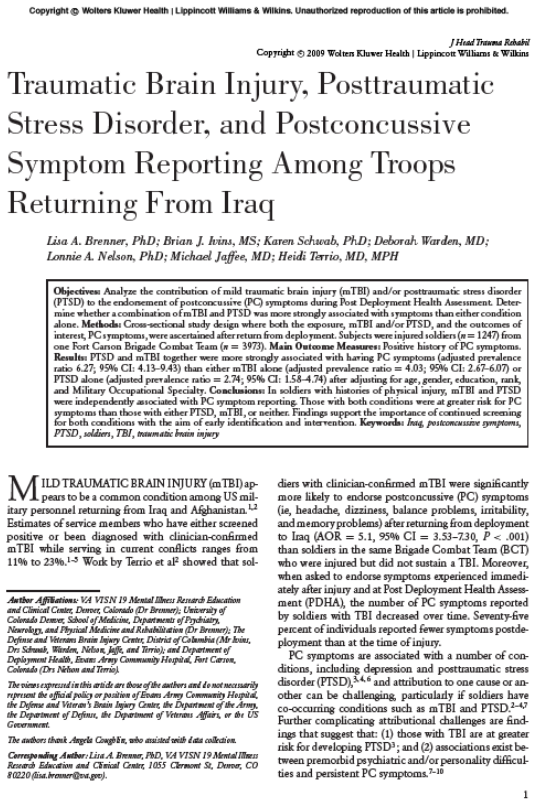
"Patients with mild TBI were twice as likely to develop PTSD [or other anxiety disorders]…"

"Mild traumatic brain injury (i.e., concussion) occurring among soldiers deployed in Iraq is strongly associated with PTSD…"

TBI-BH ECHO

Increased Symptoms with TBI + PTSD

"In Soldiers with histories of physical injury, mTBI and PTSD were independently associated with PC symptom reporting. Those with both conditions were at greater risk for PC symptoms than those with either PTSD, mTBI, or neither."



J Head Trauma Rehabil

Traumatic Brain Injury, Posttraumatic Stress Disorder, and Postconcussive Symptom Reporting Among Troops Returning From Iraq

Lisa A. Brenner, PhD; Brian J. Ivins, MS; Karen Schwab, PhD; Deborah Warden, MD; Lonnie A. Nelson, PhD; Michael Jaffee, MD; Heidi Terrio, MD, MPH

Objectives: Analyze the contribution of mild traumatic brain injury (mTBI) and/or posttraumatic stress disorder (PTSD) to the endorsement of postconcussive (PC) symptoms during Post Deployment Health Assessment. Determine whether a combination of mTBI and PTSD was more strongly associated with symptoms than either condition alone. **Methods:** Cross-sectional study design where both the exposure, mTBI and/or PTSD, and the outcomes of interest, PC symptoms, were ascertained after return from deployment. Subjects were injured soldiers ($n = 1247$) from one Fort Carson Brigade Combat Team ($n = 3973$). **Main Outcome Measures:** Positive history of PC symptoms. **Results:** PTSD and mTBI together were more strongly associated with having PC symptoms (adjusted prevalence ratio 6.27; 95% CI: 4.13–9.43) than either mTBI alone (adjusted prevalence ratio = 4.03; 95% CI: 2.67–6.07) or PTSD alone (adjusted prevalence ratio = 2.74; 95% CI: 1.58–4.74) after adjusting for age, gender, education, rank, and Military Occupational Specialty. **Conclusions:** In soldiers with histories of physical injury, mTBI and PTSD were independently associated with PC symptom reporting. Those with both conditions were at greater risk for PC symptoms than those with either PTSD, mTBI, or neither. Findings support the importance of continued screening for both conditions with the aim of early identification and intervention. **Keywords:** *Iraq, postconcussive symptoms, PTSD, soldiers, TBI, traumatic brain injury*

MILD TRAUMATIC BRAIN INJURY (mTBI) appears to be a common condition among US military personnel returning from Iraq and Afghanistan.[1,2] Estimates of service members who have either screened positive or been diagnosed with clinician-confirmed mTBI while serving in current conflicts ranges from 11% to 23%.[1–5] Work by Terrio et al[2] showed that soldiers with clinician-confirmed mTBI were significantly more likely to endorse postconcussive (PC) symptoms (ie, headache, dizziness, balance problems, irritability, and memory problems) after returning from deployment to Iraq (AOR = 5.1, 95% CI = 3.53–7.30, $P < .001$) than soldiers in the same Brigade Combat Team (BCT) who were injured but did not sustain a TBI. Moreover, when asked to endorse symptoms experienced immediately after injury and at Post Deployment Health Assessment (PDHA), the number of PC symptoms reported by soldiers with TBI decreased over time. Seventy-five percent of individuals reported fewer symptoms postdeployment than at the time of injury.

PC symptoms are associated with a number of conditions, including depression and posttraumatic stress disorder (PTSD),[3,4,6] and attribution to one cause or another can be challenging, particularly if soldiers have co-occurring conditions such as mTBI and PTSD.[3–4,7] Further complicating attributional challenges are findings that suggest that: (1) those with TBI are at greater risk for developing PTSD[3]; and (2) associations exist between premorbid psychiatric and/or personality difficulties and persistent PC symptoms.[7–10]

Author Affiliations: VA VISN 19 Mental Illness Research Education and Clinical Center, Denver, Colorado (Dr Brenner); University of Colorado Denver, School of Medicine, Departments of Psychiatry, Neurology, and Physical Medicine and Rehabilitation (Dr Brenner), The Defense and Veterans Brain Injury Center, District of Columbia (Mr Ivins, Drs Schwab, Warden, Nelson, Jaffe, and Terrio); and Department of Deployment Health, Evans Army Community Hospital, Fort Carson, Colorado (Drs Nelson and Terrio).

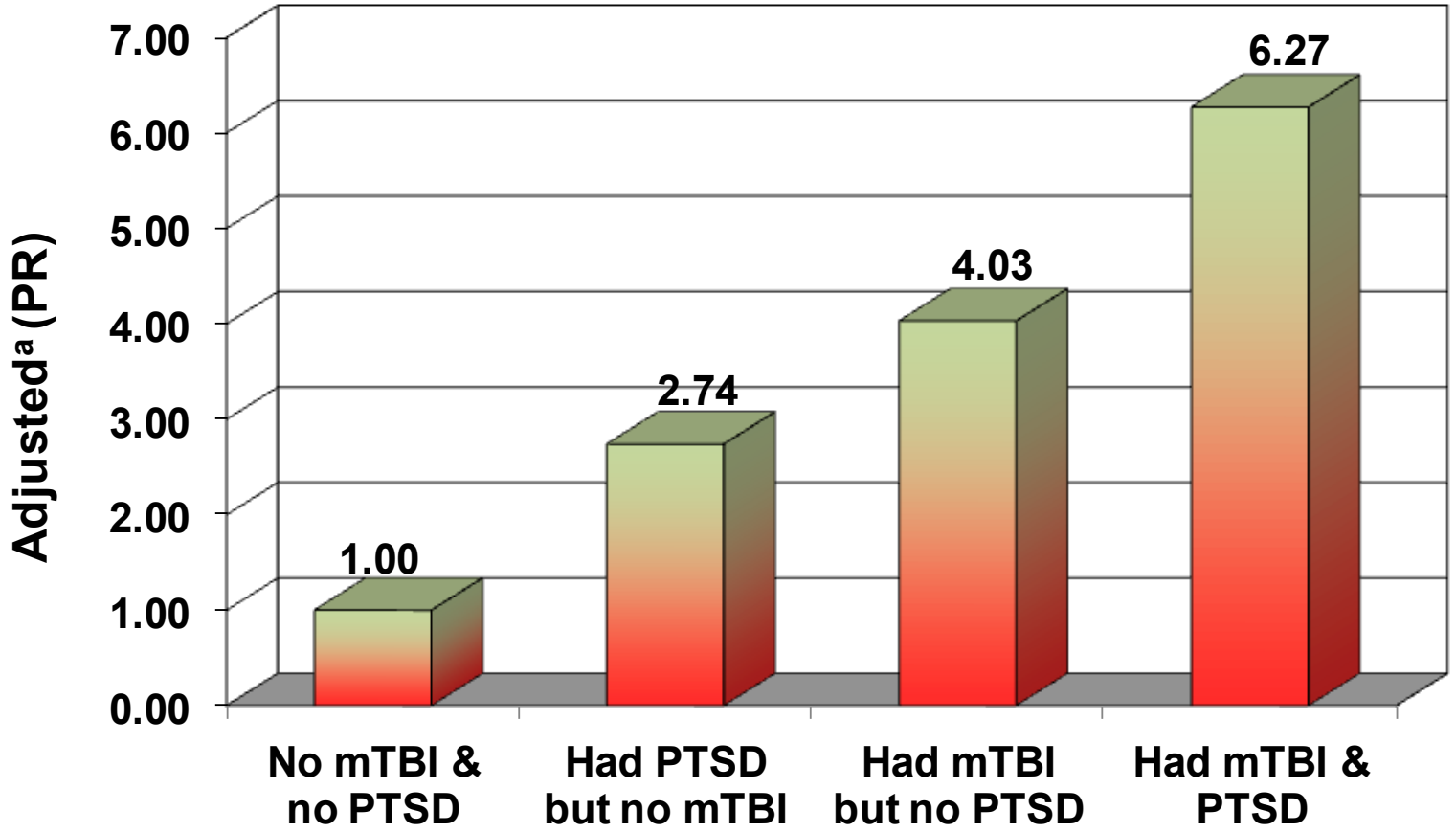
The views expressed in this article are those of the authors and do not necessarily represent the official policy or position of Evans Army Community Hospital, the Defense and Veteran's Brain Injury Center, the Department of the Army, the Department of Defense, the Department of Veterans Affairs, or the US Government.

The authors thank Angela Coughlin, who assisted with data collection.

Corresponding Author: Lisa A. Brenner, PhD, VA VISN 19 Mental Illness Research Education and Clinical Center, 1055 Clermont St, Denver, CO 80220 (lisa.brenner@va.gov).

TBI-BH ECHO

Symptom-Exposure: Any Symptoms (n = 389)



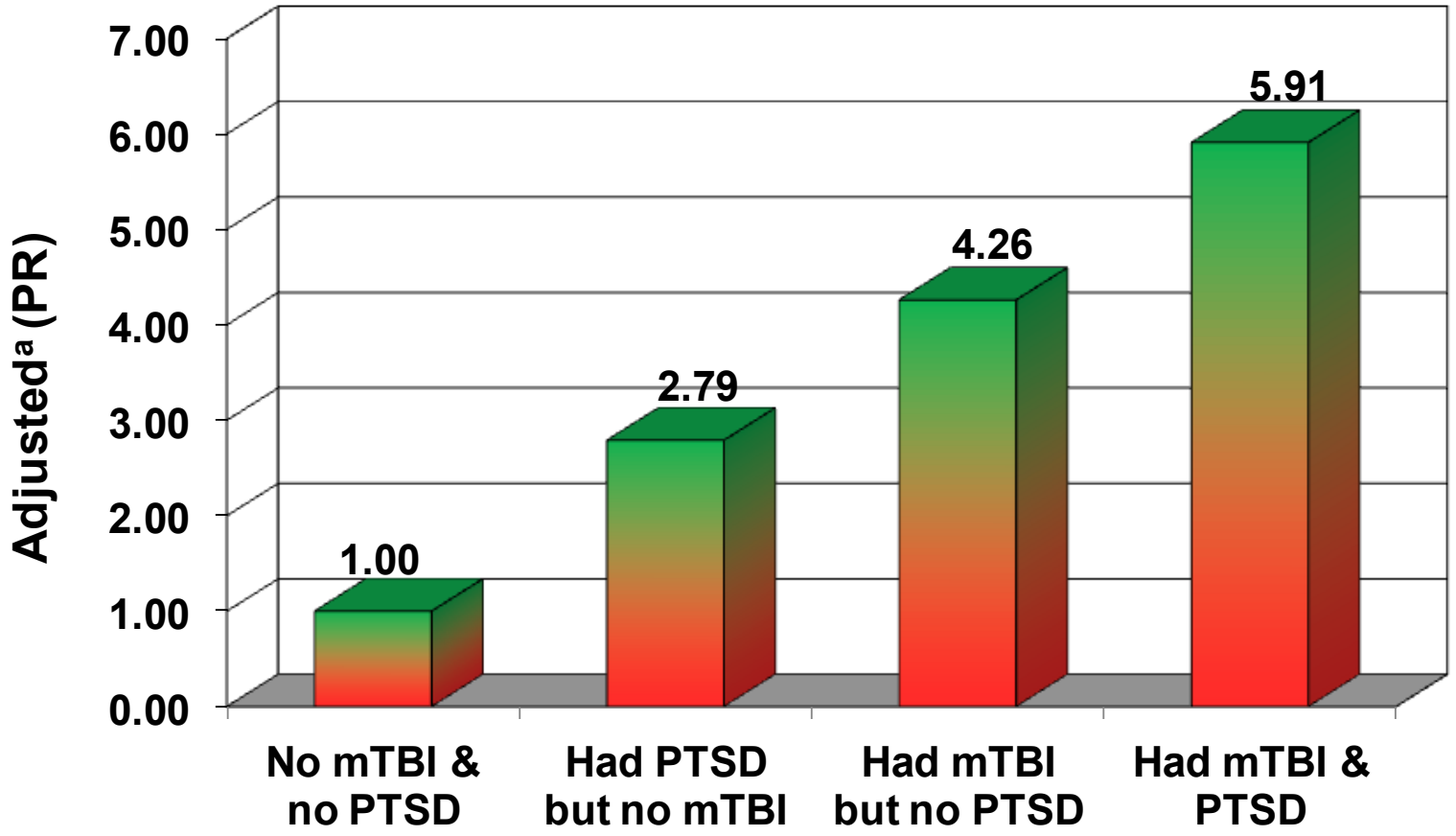
[a]Adjusted for age, gender, education, rank, and MOS

Brenner et al., 2009

Total number of Soldiers (N = 1247)

TBI-BH ECHO

Symptom-Exposure: Headache (n = 204)



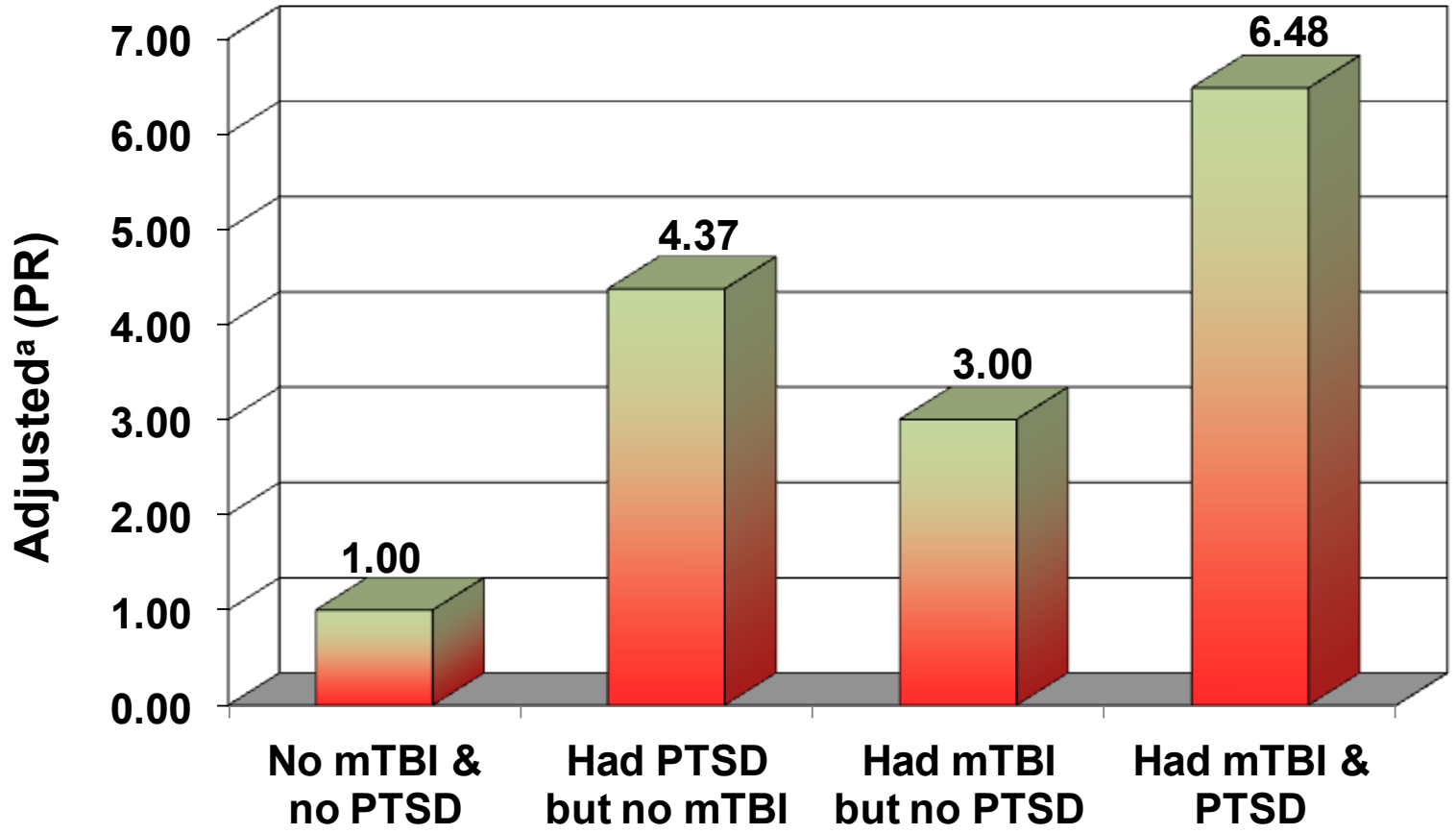
[a]Adjusted for age, gender, education, rank, and MOS

Brenner et al., 2009

Total number of soldiers (n = 1247)

TBI-BH ECHO

Symptom-Exposure: Dizziness (n = 51)



[a]Adjusted for age, gender, education, rank, and MOS

Brenner et al., 2009

Total number of Soldiers (N = 1247)

TBI-BH ECHO

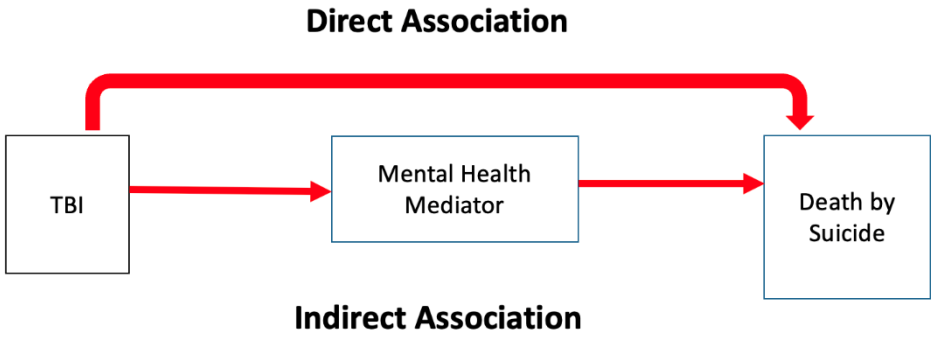
TBI and Suicide

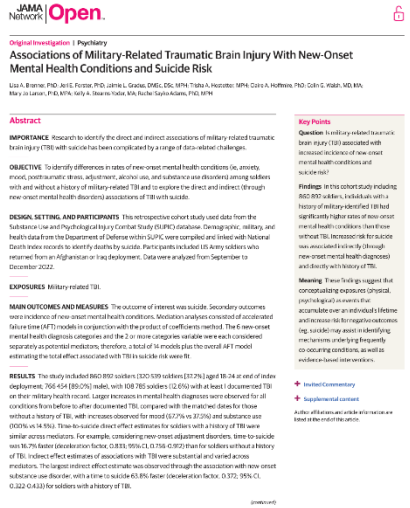
TBI-BH ECHO

Study Objectives

Identify differences in rates of new onset mental health conditions (anxiety, mood, posttraumatic stress, adjustment, alcohol use, and substance use disorders) among those with and without a history of military related TBI

Explore the direct and indirect (through new onset mental health disorders) effects of TBI on suicide

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Original Investigation | Psychiatry

Associations of Military-Related Traumatic Brain Injury With New-Onset Mental Health Conditions and Suicide Risk

Abstract

Key Points

Results

108,785 soldiers (12.6%) had a history of TBI

- Most of the cohort was:
  - aged 18-29 (62.4%)
  - male (89%
  - White, non-Hispanic (62.7%), followed by Black non-Hispanic (16.7%) and Hispanic (10.6%)

Characteristic	Individuals, No. (%)		
	Overall (N = 860 892)	History of TBI (n = 108 785)	No history of TBI (n = 752 107)
Age category at end of index deployment, y			
18-24	320 539 (37.2)	40 932 (37.6)	279 607 (37.2)
25-29	217 269 (25.2)	28 342 (26.1)	188 927 (25.1)
30-34	117 581 (13.7)	16 295 (15.0)	101 286 (13.5)
35-39	91 999 (10.7)	12 197 (11.2)	79 802 (10.6)
≥40	113 504 (13.2)	11 019 (10.1)	102 485 (13.6)
Sex assigned in the medical record			
Male	766 454 (89.0)	100 766 (92.6)	665 688 (88.5)
Female	94 438 (11.0)	8019 (7.4)	86 419 (11.5)
Race and ethnicity			
American Indian or Alaskan Native	7916 (0.9)	1195 (1.1)	6721 (0.9)
Asian or Pacific Islander	68 698 (8.0)	10 768 (9.9)	57 930 (7.7)
Black non-Hispanic	143 344 (16.7)	15 847 (14.6)	127 497 (17.0)
Hispanic	91 360 (10.6)	12 804 (11.8)	78 556 (10.4)
White non-Hispanic	539 411 (62.7)	66 787 (61.4)	472 624 (62.8)
Other[a]	7838 (0.9)	1159 (1.1)	6679 (0.9)
Unknown or missing[b]	2325 (0.3)	225 (0.2)	2100 (0.3)
Fiscal year of return from index deployment			
2008-2009	316 420 (36.8)	47 383 (43.6)	269 037 (35.8)
2010-2011	326 101 (37.9)	41 579 (38.2)	284 522 (37.8)
2012-2014	218 371 (25.4)	19 823 (18.2)	198 548 (26.4)
Rank group			
Junior enlisted (E1-E4)	413 451 (48.0)	51 260 (47.1)	362 191 (48.2)
Senior enlisted (E5-E9) or warrant officer	339 195 (39.4)	48 861 (44.9)	290 334 (38.6)
Officer	108 241 (12.6)	8663 (8.0)	99 578 (13.2)
Missing	5 (<0.1)	1 (<0.1)	4 (<0.1)
Index deployment group			
First deployers	598 307 (69.5)	65 780 (60.5)	532 527 (70.8)
≥2 Deployers	262 585 (30.5)	43 005 (39.5)	219 580 (29.2)

Mental Health Diagnosis Category by TBI Status

Diagnosis category	History of TBI (n = 108 785)				No history of TBI (n = 752 107)			
	No. (%)				No. (%)			
	Before TBI	After TBI	Before vs after change, %	New-onset after TBI, No. (%)	Before match date	After match date	Before vs after change, %	New onset after match date, No. (%)
Anxiety	25 775 (23.7)	45 046 (41.4)	74.8	27 882 (25.6)	55 613 (7.4)	90 231 (12.0)	62.4	73 786 (9.8)
Mood	24 460 (22.5)	40 997 (37.7)	67.7	24 326 (22.4)	62 363 (8.3)	85 731 (11.4)	37.5	66 631 (8.9)
PTSD	22 592 (20.8)	44 204 (40.6)	95.6	26 044 (23.9)	30 320 (4.0)	57 723 (7.7)	90.3	48 347 (6.4)
Adjustment	33 144 (30.5)	45 526 (41.9)	37.3	25 960 (23.9)	85 757 (11.4)	106 275 (14.1)	23.9	83 128 (11.1)
Alcohol use	14 035 (12.9)	18 518 (17.0)	31.9	11 402 (10.5)	37 884 (5.0)	41 808 (5.6)	10.3	34 279 (4.6)
Substance use	5295 (4.9)	10 616 (9.8)	100	8392 (7.7)	17 567 (2.3)	20 131 (2.7)	14.5	17 847 (2.4)

"The largest disparity was observed for substance use disorders, in which soldiers with a history of TBI had a 100% increase compared with a 14.5% increase among soldiers without a history of TBI."

Mediation Model Results for the Association of TBI with Suicide

For the total association of TBI with suicide, the time to suicide for those with a history of **TBI was 21.3% faster** (deceleration factor, 0.787; 95% CI, 0.715-0.866) than for those without a history of TBI, after accounting for age, sex assigned in the medical record, race and ethnicity, and FY of return from index deployment. The direct effect estimate of TBI on suicide ranged from a time to suicide for soldiers with TBI **8.5% faster** (deceleration factor, 0.915; 95% CI, 0.829-1.010) than those without a TBI for the **2 or more mental health diagnoses** category model, to a time to suicide for soldiers with TBI **16.7% faster** (deceleration factor, 0.833; 95% CI, 0.756-0.918) than those without a **TBI for the adjustment disorder model**.

New onset mental health category (mediator)	Estimate (95% CI)			
	Direct effect deceleration factor[a]	TBI relative risk for mental health category[b]	Mediator deceleration factor[a]	Indirect effect deceleration factor[a]
Anxiety	0.834 (0.756-0.920)	2.61 (2.58-2.64)	0.725 (0.656-0.802)	0.735 (0.670-0.814)
Mood	0.874 (0.792-0.964)	2.52 (2.49-2.58)	0.540 (0.490-0.596)	0.566 (0.518-0.622)
PTSD	0.863 (0.781-0.953)	3.63 (3.58-3.68)	0.641 (0.574-0.716)	0.563 (0.485-0.653)
Adjustment	0.833 (0.756-0.918)	2.14 (2.11-2.17)	0.686 (0.623-0.755)	0.750 (0.700-0.810)
Alcohol	0.852 (0.773-0.938)	2.19 (2.15-2.24)	0.418 (0.374-0.467)	0.504 (0.460-0.551)
Substance	0.848 (0.769-0.935)	3.10 (3.02-3.18)	0.417 (0.364-0.478)	0.372 (0.322-0.433)
≥2 Categories	0.915 (0.829-1.01)	2.69 (2.66-2.72)	0.538 (0.492-0.588)	0.541 (0.495-0.591)

Mediation Model Results for the Association of TBI with Suicide

The largest **indirect effect estimate of TBI on suicide was observed for the substance use model**, such that for soldiers with TBI, the time to suicide was **62.8% faster** (deceleration factor, 0.372; 95% CI, 0.322-0.433) through the occurrence of a **new-onset substance use disorder**, compared with soldiers without TBI. Indirect effect estimates were of similar magnitude for alcohol use disorders, PTSD, mood disorders, and 2 or more mental health condition categories, while there was a smaller indirect effect estimate for anxiety and adjustment disorders

New onset mental health category (mediator)	Estimate (95% CI)			
	Direct effect deceleration factor[a]	TBI relative risk for mental health category[b]	Mediator deceleration factor[a]	Indirect effect deceleration factor[a]
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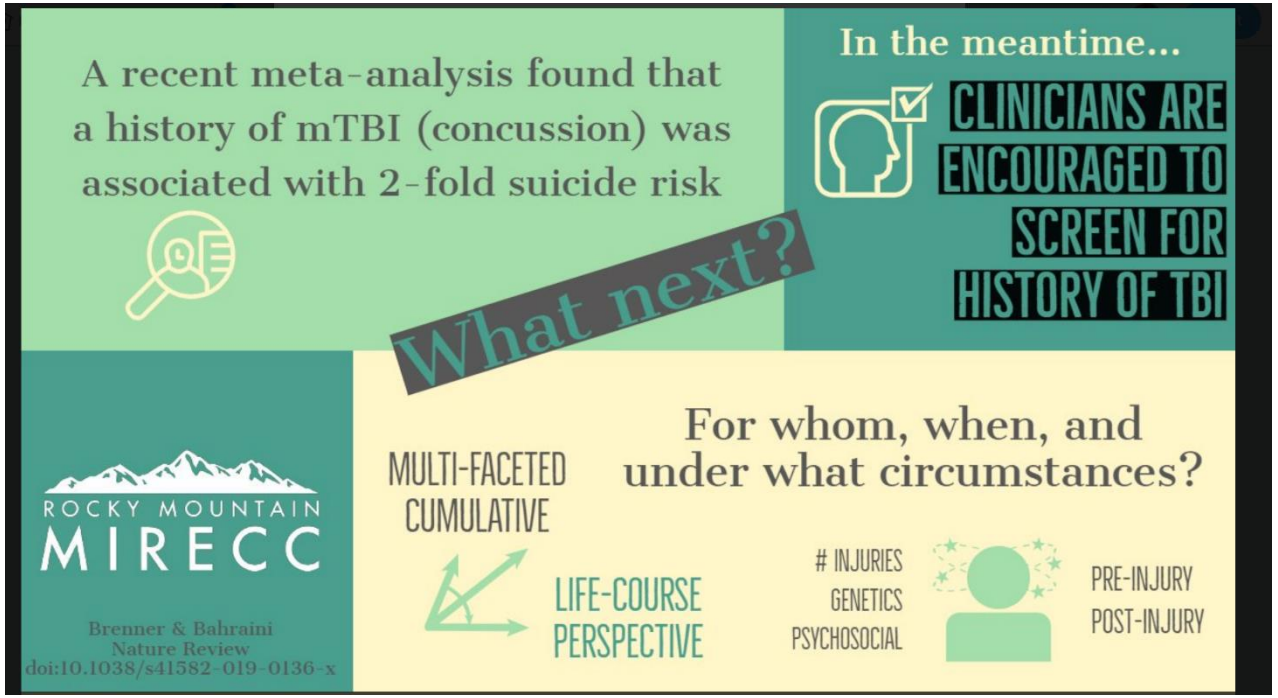
Summary of Results/Discussion

Soldiers with a history of military identified TBI had notably higher rates of new onset mental health conditions than those without this injury

- Larger increases in mental health diagnoses pre- to post-TBI were observed for all mental health categories
- Frequencies of new onset mental health diagnoses were more than double among the group with TBI

Increased risk for suicide was associated indirectly (through new onset mental health diagnoses) and directly with history of TBI

Increased efforts are needed to conceptualize the accumulation of risk associated with multiple military-related exposures and identify evidence-based interventions which address mechanisms associated with frequently co-occurring conditions



nature REVIEWS NEUROLOGY

TRAUMATIC BRAIN INJURY

Concussion and risk of suicide: who, when and under what circumstances?

Lisa A. Brenner & Nazanin H. Bahraini

Nature Reviews Neurology **15**, 132–133 (2019) | Download Citation

A new analysis has found that concussion and mild traumatic brain injury (mTBI) are linked to an increased risk of suicidal behaviours and thoughts. However, a host of risk factors might influence this correlation, and careful investigation is required to establish which individuals with mTBI might be most at risk of suicide.

TBI-BH ECHO

In the early days of the conflicts in Iraq and Afghanistan, Brenner and colleagues wrote about mTBI, post-traumatic stress disorder, other polytrauma conditions and the burden of adversity hypothesis.

This hypothesis posits that greater cumulative exposure to lifetime adversities and trauma increases the risk of negative mental and physical health outcomes. Applying this framework to mTBI, Brenner et al. proposed that post-mTBI outcomes among military personnel are influenced by an **accumulation of life events and adversities**, including those that are deployment-related as well as those that occur before and after military service.

The team concluded that the burden of adversity hypothesis could be used as a framework to potentially explain why some individuals would go on to experience a host of adverse outcomes post-mTBI, while others would recover with minor symptoms or complications.

> "we need to acknowledge the inherent heterogeneity among individuals who sustain concussions"

Treatment Recommendations

TBI-BH ECHO

National Academy of Medicine (NAM) Classification

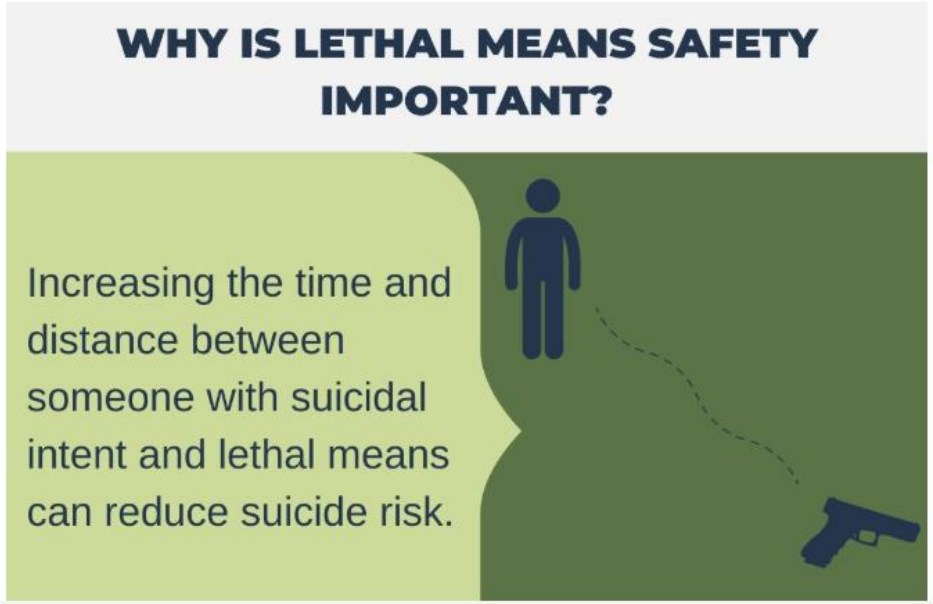
U.S. Department of Veterans Affairs

TBI-BH ECHO

Lethal Means and Safety and Suicide Prevention

- Lethal means are objects (e.g., medications, firearms, sharp objects) that can be used to engage in Suicidal Self-Directed Violence (S-SDV)*, including suicide attempts.

- Facilitating lethal means safety is an essential component of effective suicide prevention.



Why is lethal means safety important? Increasing the time and distance between someone with suicidal intent and lethal means can reduce suicide risk.

TBI-BH ECHO

- ***Why?*** Lethal means safety during a critical period can save a Veteran's life

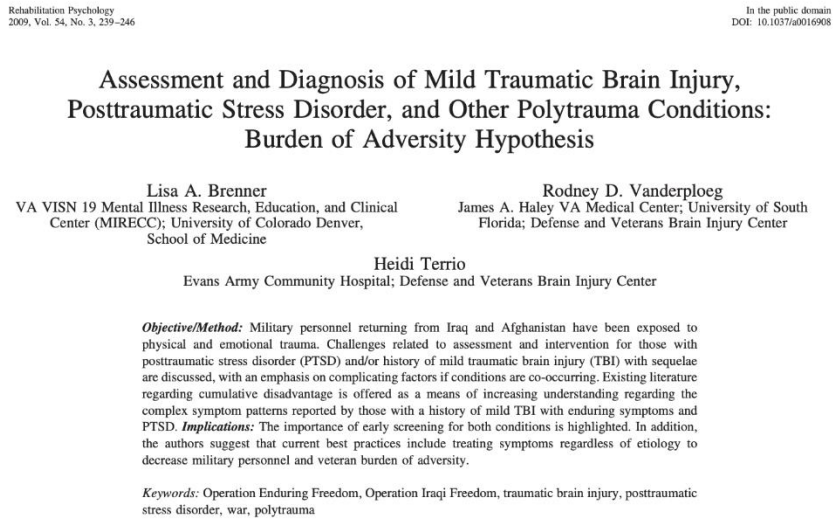
- ***Who?*** Strategies to promote Lethal Means Safety (LMS) should be discussed with all Veterans with High or Intermediate Acute or Chronic suicide risk

- ***What?*** Providing Lethal Means Safety Counseling (LMSC) & information about accessing tangible materials to facilitate lethal means safety (e.g., firearm locking devices, medication disposal kits) will save lives

41

Analyzing life course trajectories of older adults, O'Rand (1996) suggested that "patterns of inequality" transpired over time secondary to the interaction between institutional mechanisms and individual difference. She suggested this interplay resulted in increasing heterogeneity and inequality between aging cohorts.

The theory has also been used to explain how an accumulation of disadvantaged genetic and/or environmental factors can result in a cascade of physical and psychiatric risk.



Rehabilitation Psychology
2009, Vol. 54, No. 3, 239–246

DOI: 10.1037/a0016908

Assessment and Diagnosis of Mild Traumatic Brain Injury, Posttraumatic Stress Disorder, and Other Polytrauma Conditions: Burden of Adversity Hypothesis

Lisa A. Brenner
VA VISN 19 Mental Illness Research, Education, and Clinical Center (MIRECC); University of Colorado Denver, School of Medicine

Rodney D. Vanderploeg
James A. Haley VA Medical Center; University of South Florida; Defense and Veterans Brain Injury Center

Heidi Terrio
Evans Army Community Hospital; Defense and Veterans Brain Injury Center

Objective/Method: Military personnel returning from Iraq and Afghanistan have been exposed to physical and emotional trauma. Challenges related to assessment and intervention for those with posttraumatic stress disorder (PTSD) and/or history of mild traumatic brain injury (TBI) with sequelae are discussed, with an emphasis on complicating factors if conditions are co-occurring. Existing literature regarding cumulative disadvantage is offered as a means of increasing understanding regarding the complex symptom patterns reported by those with a history of mild TBI with enduring symptoms and PTSD. ***Implications:*** The importance of early screening for both conditions is highlighted. In addition, the authors suggest that current best practices include treating symptoms regardless of etiology to decrease military personnel and veteran burden of adversity.

Keywords: Operation Enduring Freedom, Operation Iraqi Freedom, traumatic brain injury, posttraumatic stress disorder, war, polytrauma

Treat the symptoms with evidence-based interventions

Rehabilitation Psychology
2009, Vol. 54, No. 3, 239–246

DOI: 10.1037/a0016901

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Lisa A. Brenner
VA VISN 19 Mental Illness Research, Education, and Clinical Center (MIRECC); University of Colorado Denver, School of Medicine

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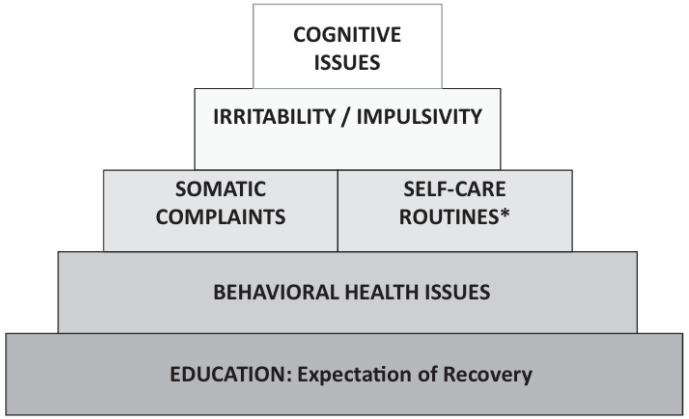

Figure 3. Traumatic brain injury step-care treatment model. *Includes sleep hygiene, diet, exercise, and avoiding further traumatic brain injury.

TBI-BH ECHO

Welcome to the Toolkit!

https://www.mirecc.va.gov/visn19/tbi_toolkit/

TBI-BH ECHO

Screening and Assessment

Screening

Assessment

Screening

Screening refers to a preliminary procedure, such as a test or examination, to detect the signs of a disorder that may require further evaluation. It can be helpful to consider integrating screening instruments to detect the possible presence of different health conditions, mental health symptoms, and unhealthy or problematic behaviors (e.g., substance misuse, suicidal thoughts or behavior). These measures are often brief and easy to administer (e.g., self-report).

In instances in which someone is determined to be at elevated risk, you should strongly consider consulting with a licensed provider for further assessment and, if warranted, intervention. Importantly, these measures should **NOT** serve as a substitute for a robust diagnostic clinical interview, but rather serve to inform who may benefit from further assessment. This is especially important as disentangling some of these factors, for example neurocognitive impact due to TBI versus depression, can be complex and require in-depth assessment (e.g., neuropsychological evaluation).

Screening & Assessment Tools

TBI-BH ECHO

Interventions

Intervention is defined as an act performed to prevent harm to a patient or to improve the mental, emotional, or physical function of a patient. Interventions referenced in this toolkit are aimed at treating symptoms associated with TBI and common co-occurring mental health conditions. There are currently no widely established evidence-based practices (EBPs) focused on TBI therefore many of these resources focus on symptom management and accommodations.

Adapting Interventions for Neurocognitive Deficits

Accommodations for neurocognitive deficits:

- Interventions should be introduced with a simple rationale
- Minimize environmental distractions
- Slow down the pace, provide frequent opportunities for patients to respond, generate feedback, and provide reinforcement to maintain patient engagement
- Provide written material/handouts where possible
- Repetition of key points
- Non-electronic devices might include checklists, pictures or icons, photograph cues, post-it notes, calendars, planners, and journals

Management Strategies

Those with a history of mTBI may benefit from any number of EBPs and may or may not require modifications to treatment delivery. Those with a history of moderate to severe TBI are most likely to require modifications to treatment delivery.[2]

The Ohio Valley Center for Brain Injury Prevention and Rehabilitation has produced a training module titled: "Accommodating the Symptoms of TBI." Through this training you will learn to recognize the common symptoms of TBI and how to incorporate compensatory strategies into treatment practices to increase the odds of treatment success."

Access the Training Here

Below are examples of several challenges professionals often face when implementing interventions with individuals with a history of TBI. Specific strategies are provided with each question. [1]

Are they having a difficult time learning or remembering information they hear? +

▲ Return to top

Clinical Practice Guidelines

The following provides links to clinical practice guidelines offering information and direction to providers managing clients' recovery from the effects of TBI and co-occurring conditions.

Each guideline highlights critical decision points, and provides comprehensive, evidence-based recommendations for practitioners throughout the DoD and VA health care systems.

- Management and Rehabilitation of Post-Acute Mild Traumatic Brain Injury (mTBI) (2021)
- Military Health Systems TBI Center of Excellence (TBICoE)
- Guidelines for Concussion/Mild TBI and Persistent Symptoms (Ontario Neurotrauma Foundation)
- Assessment and Management of Patients at Risk for Suicide (2019)
- Management of Substance Use Disorder (SUD) (2021)
- Management of Major Depressive Disorder (MDD) (2022)
- Management of Posttraumatic Stress Disorder and Acute Stress Reaction 2017
- Management of Opioid Therapy (OT) for Chronic Pain (2017)
- The Primary Care Management of Headache
- 2021 Progressive Return to Activity (PRA) Following Acute Concussion/Mild Traumatic Brain Injury Clinical Recommendation
- Clinical Practice Guideline for the rehabilitation of Adults with Moderate to Severe TBI

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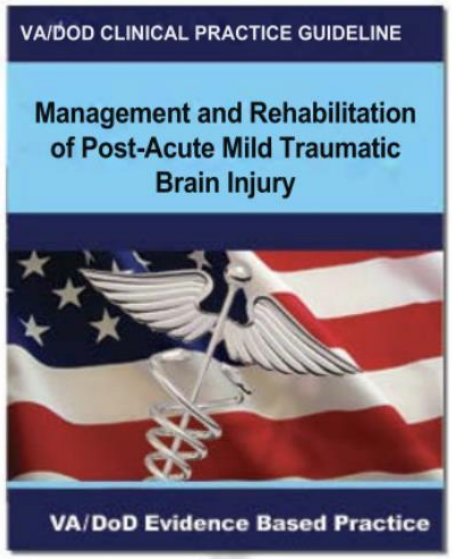
Management and Rehabilitation of Post-Acute Mild Traumatic Brain Injury (mTBI) (2021)



The guideline describes the critical decision points in the Management and Rehabilitation of Post-Acute Mild Traumatic Brain Injury (mTBI) and provides clear and comprehensive evidence based recommendations incorporating current information and practices for practitioners throughout the DOD and VA Health Care systems. The guideline is intended to improve patient outcomes and local management of patients with Post-Acute Mild Traumatic Brain Injury.

Disclaimer: This Clinical Practice Guideline is intended for use only as a tool to assist a clinician/healthcare professional and should not be used to replace clinical judgment.

https://www.healthquality.va.gov/guidelines/Rehab/mtbi/index.asp

VA/DoD CLINICAL PRACTICE GUIDELINES — June 2021

The Management and Rehabilitation of Post-Acute Mild Traumatic Brain Injury

Module A: Initial Presentation (>7 Days Post-Injury)

1. Person exposed to an external force to the head resulting in any of the following:
   - Alteration or loss of consciousness
   - Post-traumatic amnesia
2. Urgent/emergent conditions identified? (see **Sidebar 1**)
   - Yes → 3. Refer for emergency evaluation and treatment
   - No →
4. Evaluate for severity of TBI based on history (see **Sidebar 2**)
5. Is the severity moderate or severe TBI?
   - Yes → 6. Consult with a clinician with TBI experience
   - No →
7. Diagnosis of mTBI: Are symptoms present? (see **Sidebar 3**)
   - Yes → 8. Is person currently deployed on military or combat operation?
     - Yes → 9. Follow DoD policy guidance for management of mTBI in the deployed setting
     - No → 10. Go to **Module B, Box 12**
   - No →
11.
    - Provide education on mTBI and secondary injury prevention (see Appendix J: Additional Educational Materials and Resources)
    - Provide information on safe and structured return to normal and full activity and duties
    - Monitor and support recovery

Access to the full guideline and additional resources is available at the following link: https://www.healthquality.va.gov/guidelines/Rehab/mtbi/

Sidebar 1: Potential Indicators for Immediate Referral

- Declining level of consciousness
- Declining neurological exam/focal neurological symptoms
- Pupillary asymmetry
- Seizures
- Repeated vomiting
- Motor or sensory deficits
- Double vision
- Worsening headache
- Slurred speech
- Marked change in behavior or orientation

Sidebar 2: Classification of TBI Severity[a]

Criteria	Mild	Moderate	Severe
Structural imaging (see Recommendation 4)	Normal[b]	Normal or abnormal	Normal or abnormal
Loss of Consciousness	0-30 min	>30 min and <24 hours	>24 hours
Alteration of consciousness/ mental state[c]	up to 24 hours	>24 hours; severity based on other criteria	
Post-traumatic amnesia	0-1 day	>1 and <7 days	>7 days
Glasgow Coma Scale (best available score in first 24 hours)[d]	13-15	9-12	<9

[a] If patient meets criteria in more than one category of severity, the higher severity level is assigned
[b] No clinically relevant findings
[c] Alteration of mental status must be immediately related to the trauma to the head; typical symptoms would be: looking and feeling dazed and uncertain of what is happening, confusion, difficulty thinking clearly or responding appropriately to mental status questions, and/or being unable to describe events immediately before or after the injury event
[d] In April 2015, the DoD released a memorandum recommending against the use of Glasgow Coma Scale scores to diagnose TBI (see the memorandum for additional information: https://www.health.mil/Reference-Center/Policies/2015/04/06/Traumatic-Brain-Injury-Updated-Definition-and-Reporting)

Sidebar 3: Possible Post-Concussion Symptoms[a,b]

Physical Symptoms	Cognitive Symptoms	Behavior/Emotional Symptoms
• Headache • Dizziness/vertigo • Balance problems • Nausea • Fatigue • Sleep disturbance • Visual disturbance • Sensitivity to light • Hearing difficulties/loss • Tinnitus • Sensitivity to noise	Problems with: • Attention • Concentration • Memory • Speed of processing • Judgment • Executive functions • Speech and language • Visual-spatial function	• Depression • Anxiety • Agitation • Irritability • Impulsivity • Aggression

[a] Symptoms that may develop within 30 days post-injury
[b] Symptoms can be monitored with instruments such as the NSI or RPCQ

Abbreviations: CPG: clinical practice guideline; DoD: Department of Defense; mTBI: mild traumatic brain injury; NSI: Neurobehavioral Symptom Inventory; PTSD: posttraumatic stress disorder; RPCQ: Rivermead Post-Concussion Questionnaire; SUD: substance use disorder; TBI: traumatic brain injury; VA: Department of Veterans Affairs

VA/DoD CLINICAL PRACTICE GUIDELINES — June 2021

Module B: Management of Symptoms Persisting >7 days After mTBI

12. Patient with persistent symptoms after mTBI (see **Sidebar 3**)
13. Complete history and physical examination, including symptom attributes, intimate partner violence, neurologic and mental status exams, psychosocial evaluation, and suicide risk (see **Sidebars 3** and **4**); assess patient priorities
14. Evaluate for other conditions including but not limited to chronic pain, sleep disorders, depression, PTSD, anxiety, and SUD (see **Sidebar 5**)
15. Develop and implement a patient-centered, individualized treatment plan for mTBI and other common co-occurring conditions by referring to recommendations from relevant VA/DoD CPGs (see **Sidebar 5**)
16. Educate patient/caregiver on symptoms and expected recovery (see **Sidebar 6**)
17. Are symptoms persistent and functionally limiting 30 days after mTBI despite symptom-based treatment?
    - Yes → 18. Initiate further symptom-based treatment (see Recommendations 10-16)
      - 19. Consider consult and collaboration with a clinician with TBI experience
      - 20. Has treatment plan been completed?
        - Yes → 21.
          - Continue management as appropriate
          - Monitor for comorbid conditions
          - Address:
            - Return to work/duty/activity
            - Community participation
            - Family/social issues
        - No → 22. Consider case management with ongoing symptom-based primary care (see **Sidebar 7**)
    - No →

Sidebar 4: Symptom Attributes

- Duration, onset, and location of symptom
- Previous episodes, treatment and response
- Patient perception of symptom
- Impact on functioning
- Factors that exacerbate or alleviate symptoms

Sidebar 6: Early Intervention

- Integrate patient and caregiver needs and preferences into assessment and treatment
- Provide information and education on symptoms and expected recovery
- Provide reassurance on expectation of positive recovery
- Educate about prevention of further injury
- Empower patient for self-management
- Consider teaching relaxation and stress management techniques as needed
- Recommend limiting use of caffeine/nicotine/alcohol
- Encourage monitored progressive return to normal duty/work/activity/exercise[a]
- Discuss need for consistency with healthy nutrition, exercise, and sleep habits
- Provide information regarding the National Suicide Prevention Lifeline (1-800-273-8255) if appropriate

[a] Provider resources for progressive return to activity (PRA) are available at: https://www.health.mil/About-MHS/OASDHA/Defense-Health-Agency/Research-and-Development/Traumatic-Brain-Injury-Center-of-Excellence/Provider-Resources

Sidebar 5: Relevant VA/DoD CPGs

- VA/DoD Clinical Practice Guideline for the Management of Chronic Insomnia Disorder and Obstructive Sleep Apnea. Available at: https://www.healthquality.va.gov/guidelines/CD/insomnia/index.asp
- VA/DoD Clinical Practice Guideline for the Management of Major Depressive Disorder. Available at: https://www.healthquality.va.gov/guidelines/MH/mdd/
- VA/DoD Clinical Practice Guideline for the Management of Opioid Therapy for Chronic Pain. Available at: https://www.healthquality.va.gov/guidelines/Pain/cot/
- VA/DoD Clinical Practice Guideline for the Management of Posttraumatic Stress Disorder and Acute Stress Reaction. Available at: https://www.healthquality.va.gov/guidelines/MH/ptsd/
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- VA/DoD Clinical Practice Guideline for the Primary Care Management of Headache. Available at: https://www.healthquality.va.gov/guidelines/Pain/headache/
- VA/DoD Clinical Practice Guideline for the Management of Chronic Multisymptom Illness. Available at: https://www.healthquality.va.gov/guidelines/MR/cmi/
- VA/DoD Clinical Practice Guideline for the Assessment and Management of Patients at Risk for Suicide. Available at: https://www.healthquality.va.gov/guidelines/MH/srb/

Sidebar 7: Case Management

Case managers may:

- Provide coordination of care as outlined in the individualized treatment plan (referrals, authorizations, appointments/reminders)
- Provide advocacy and support for Veteran/Service Member and caregivers
- Reinforce early interventions and education
- Address psychosocial issues (financial, family, housing, or school/work)
- Connect patient to available resources

www.healthquality.va.gov/guidelines/Rehab/mtbi/VADODmTBICPGPocketCardFinal508.pdf

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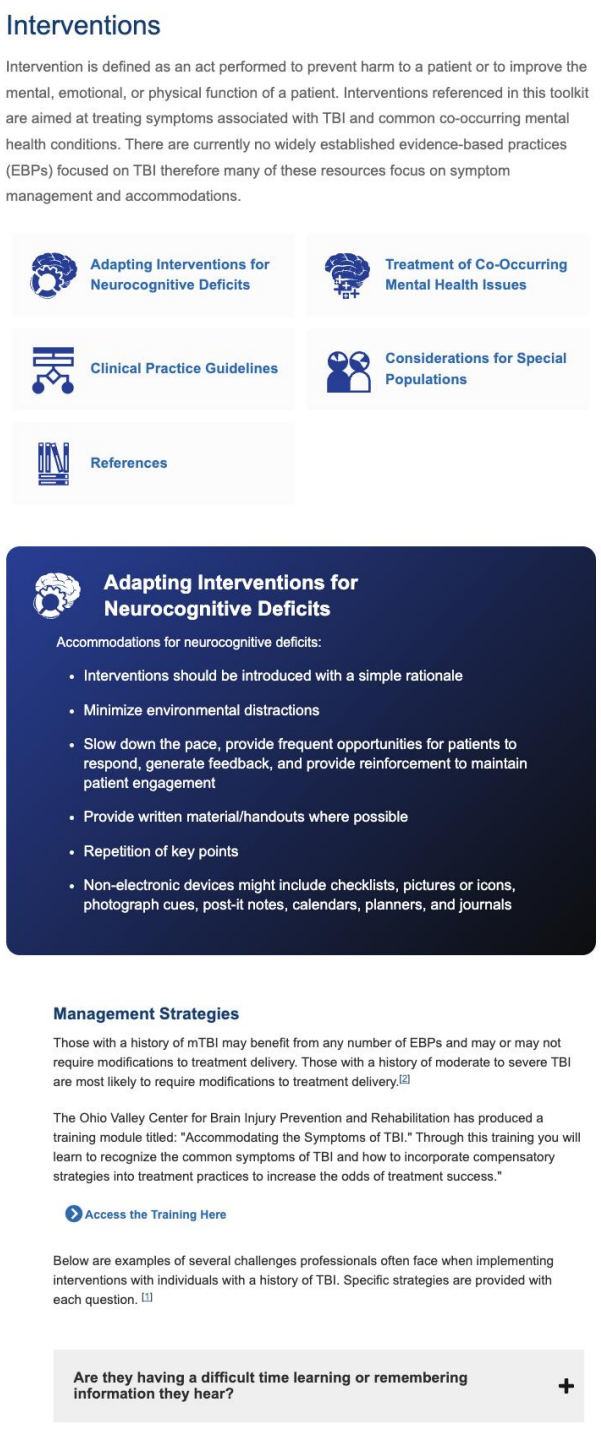

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- Treatment of Co-Occurring Mental Health Issues
- Clinical Practice Guidelines
- Considerations for Special Populations
- References

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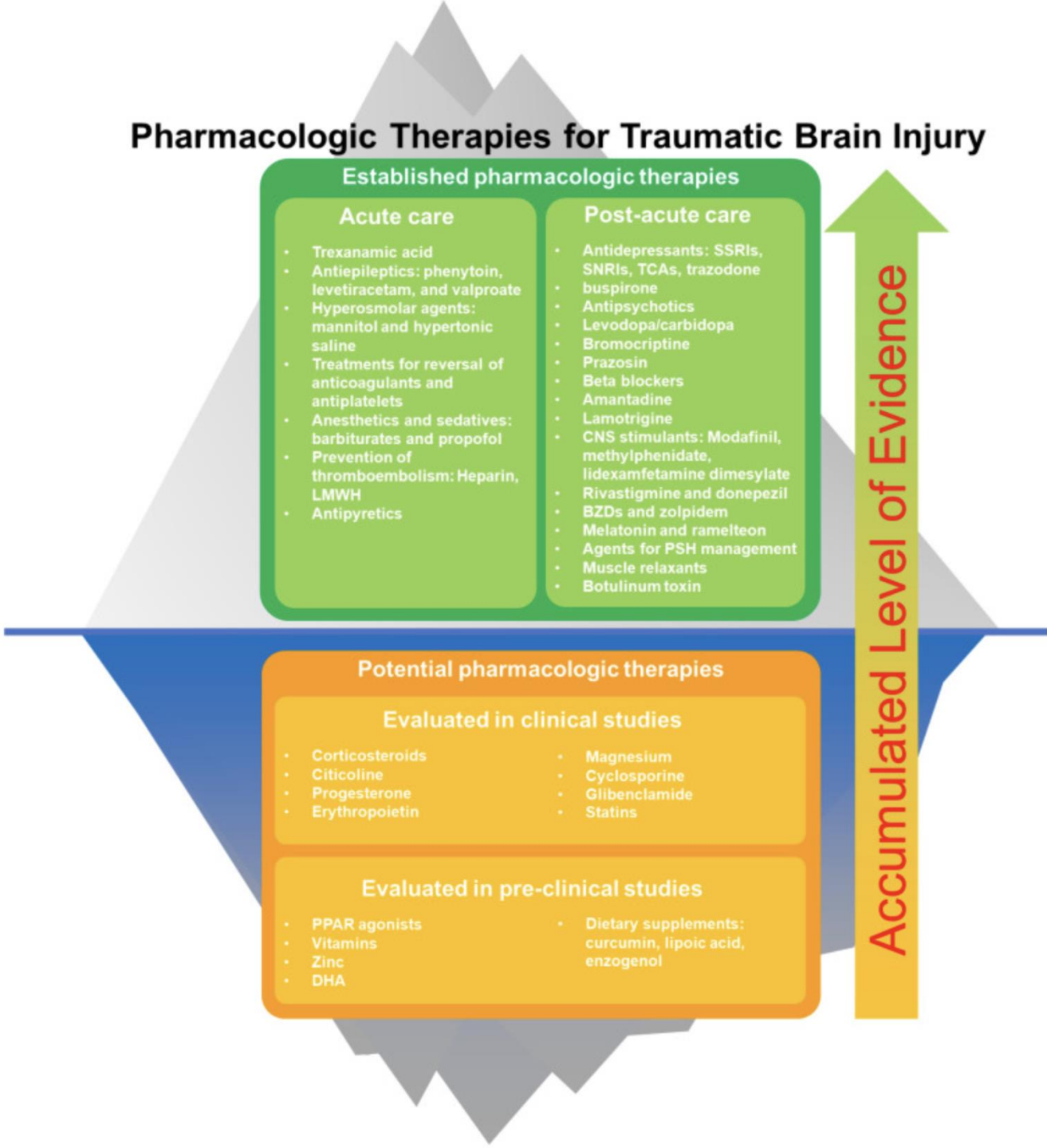
Are they having a difficult time learning or remembering information they hear? +

Individuals with mild, moderate, and severe TBI can benefit from evidence-based psychotherapy

TBI-BH ECHO



pharmaceuticals
MDPI

Review

Current and Potential Pharmacologic Therapies for Traumatic Brain Injury

Jowy Tani [1,2,3,4,5,6,7], Ya-Ting Wen [7,8,9], Chaur-Jong Hu [4,7,10] and Jia-Ying Sung [1,4,7,*]

TBI-BH ECHO

Case Presentation

A 55 year old male seeks assistance from their primary care provider for a history of headaches, dizziness, sleep disturbance, and "feeling stressed". The individual was recently lost their job as a federal employee. He reports a history of military service with deployments to Iraq. Mr. Jones also notes a history of one suicide attempt and multiple mild TBIs. The first TBI he sustained was in high school while playing football.

Screening -> Assessment -> Safety ->
Which symptoms/conditions are most distressing? ->
Evidence-based interventions

"…talk to a professional. That's why you guys are here professionally trained to deal with people with my problem or problems like I have, you know…Left to myself, I'd probably kill myself. But that didn't feel right so I turned to professionals, you guys. "

TBI-BH ECHO

Lisa.2.Brenner@cuanschutz.edu

Many thanks to our funders and collaborators

Congressionally Directed Medical Research Programs
CDMRP
Department of Defense

U.S. Department of Veterans Affairs

HRSA

COLORADO
Office of Community Access & Independence
Division of Vocational Rehabilitation
DVR

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