Management of TBI Rehabilitation/Co-Occurring Mental Health Issues: Depression, Pain, & Substance Use Disorders

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Department of Veterans Affairs

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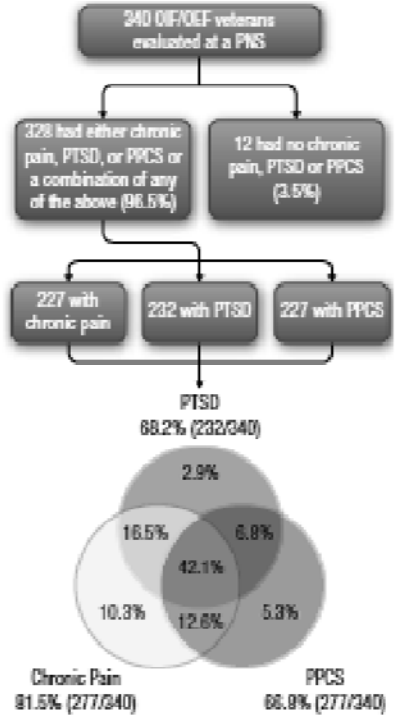
Frequency of Possible Diagnoses among OEF and OIF Veterans

Musculoskeletal (710-739	57.1%
Mental Disorders (290-319)	53.3%
Symptoms/signs/ill defined (780-799)	52.4%
Nervous system/sense organs (320-389)	45.3%
Endocrine/nutrition/metabolic (240-279)	32.9%
Injury/poisonings (800-999)	29.2%
Respiratory (460-519)	26.5%

* Data cited from VA Health Care Utilization by Recent Veterans, Epidemiology Program, Office of Public Health, VHA
* These are cumulative data since Oct 1 2002, with data on hospitalizations and outpatient visits as of June 30, 2012; Veterans can have multiple diagnoses with each health care encounter. A Veteran is counted only once in any single diagnostic category but can be counted in multiple categories, so the above numbers add up to greater than 834,463; percentages add up to greater than 100 for the same reason.
† Percentages reported are approximate due to rounding.

mTBI and Co-Occurring Disorders

- The vast majority of patients who present to the clinic with a diagnosis of mild Traumatic Brain Injury (mTBI) do not often present with mTBI alone.
- Veterans with positive TBI screens are more likely to have a diagnosis of PTSD, depression, and substance abuse disorder.
- Both civilian and military literature provide evidence that the greater the burden of co-occurring disorders, the higher the likelihood that symptoms will persist following mTBI.



The polytrauma clinical triad: Distribution of patients with chronic pain, posttraumatic stress disorder (PTSD), and persistent post-concussive symptoms (PPCS) in a sample of 340 Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) veterans evaluated at Department of Veterans Affairs Boston Polytrauma Network Site (PNS).

Law et. al., Prevalence of chronic pain, posttraumatic stress disorder and persistent post-concussive symptoms in OIF/OEF veterans: Polytrauma clinical triad. JRRD, 2009, 46(6), 697-702.

Depression & TBI

- Depression is frequently noted in individuals with chronic post-concussion syndrome (Hesdorffer et al, 2009).
- Individuals with mTBI who experience depression post-injury report more symptoms and more severe symptoms than those mTBI patients without depression (Lange et al., 2010).
- This can extend to the perception of other problems, including cognitive problems in individuals with mTBI, with individuals with depression, anxiety and PTSD reporting more problems with cognitive function than other groups (Spencer et al., 2010).
- Depression after mTBI is linked to abnormal imaging results, older age at time of injury, and higher levels of depressive symptoms in the week following injury (Bay, 2009).

Pain & TBI

- A recent meta-analysis that considered veteran populations separately found a 43.1% pain prevalence rate (95% CI, 39.9%-46.3%; Nampiaparampil, 2008).
- Though that study found that brain injury has an independent relationship with chronic pain, over and above other diagnoses (i.e., PTSD or depression), other reports have demonstrated the contribution of PTSD, insomnia, fatigue, and depression to reports of pain severity (Dobschka et al., 2008).
- In addition, many veterans from the OEF/OIF/OND conflicts present with other injuries, such as amputations, orthopedic injuries, or chronic use injuries that may have occurred separately from their mTBI. In a multiply injured population, the prevalence of pain reports is generally higher and the pain is rated as more severe in civilian studies (Meerding et al., 2004).

Headache & TBI

- Headache is the most frequently cited persistent symptom following mTBI and is often the most disruptive to the individual's functional ability.
- Approximately 90% of individuals experience headache following a mild TBI (Lew et al., 2006) and they generally develop within 7 days of the injury. One third to one-half of individuals with mTBI report headache five years after injury (Dobscha et al., 2008).
- Headache origin does not follow only from impact to the head but can arise from trauma to the head or neck including: cervical spinal column, spinal cord, neck musculature (International Headache Society, 2004) .

- Early symptoms of headaches, dizziness, or nausea in the immediate period (e.g., in the Emergency Department) after mTBI have been associated with sustained post-concussion symptoms months after injury (Chamelian & Feinstein, 2004; de Kruijk et al., 2002).

Substance Use Disorders & TBI

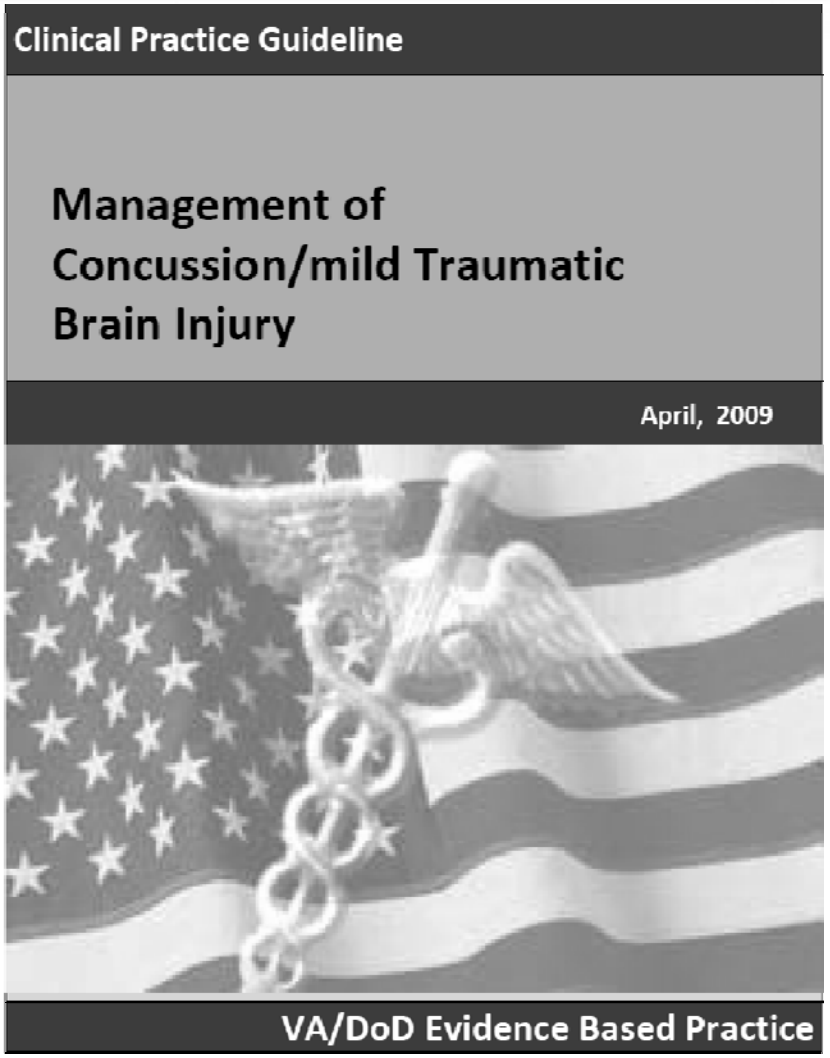
- In general, alcohol and substance use rates decline following brain injury. For example, in a civilian study at a Level I trauma center, the prevalence of substance use disorders went from 41% pre-injury to 21% post-injury (Whelan-Goodinson et al., 2009).
- In a recently published study of active duty soldiers with mTBI, there was a slightly higher rate of alcohol abuse in individuals with a comorbid mTBI diagnosis compared to other injuries (6.9% v 4.4%). However, when other factors were controlled in a multivariate

use in the presence of a co-occurring mood disorder (Jorge et al., 2009).

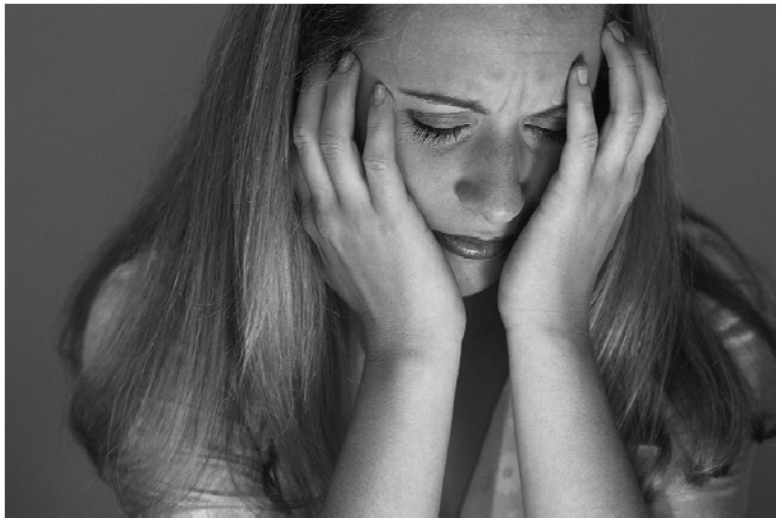
- What places an individual with mTBI at potential risk for the development of substance use problems are the cognitive and emotional deficits following the injury, in combination with the presence of poor psychosocial adjustment and coping skills (Graham & Cardon, 2008).

Treatment Guidance for mild TBI

- Guideline process was initiated in 2007
- Literature review spanned 2002-2008 and also included data from the WHO review from 1980-2002
- Includes management algorithms for initial concussion
- Does support paucity of Class A evidence for mTBI care



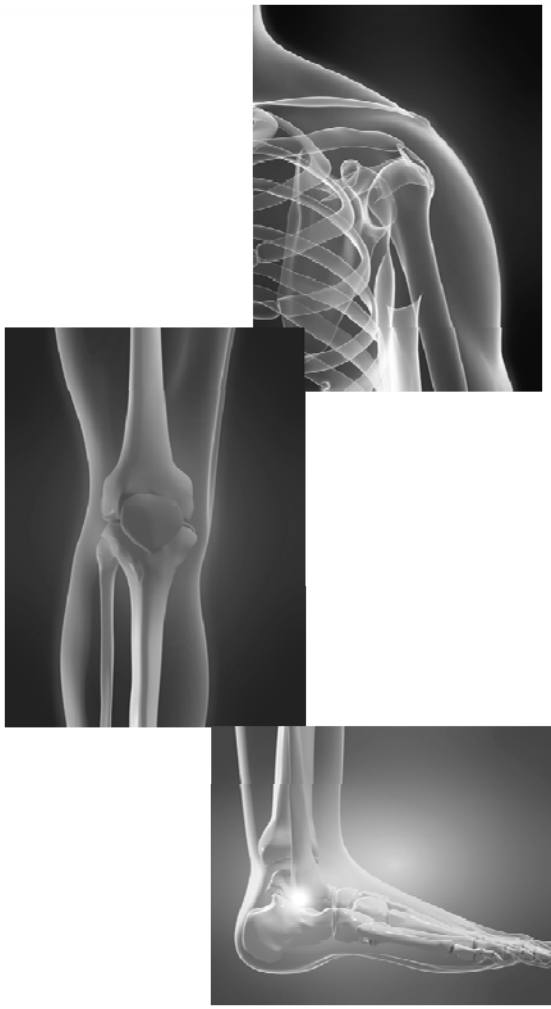
Depression



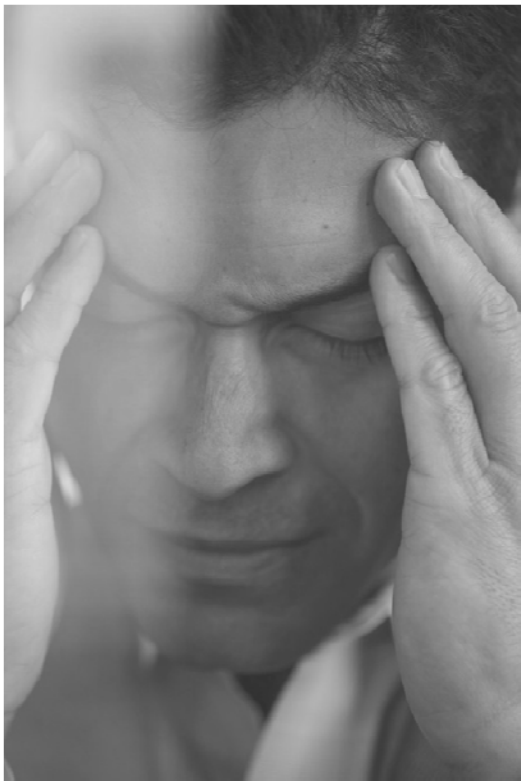
- Non-pharmacologic treatment
  - Reassurance related to recovery
  - Reduce activity restriction
  - Sleep hygiene education
  - Sleep study, if indicated
  - Regular aerobic exercise
- Pharmacotherapy recommended
  - Anti-epileptics
  - SSRI (single RCT for sertraline showed non-significant improvements; Ashman, 2009)
- AHRQ evidence synthesis reflected a paucity of evidence for treatment of depression following TBI
- Recent meta-analysis documents effectiveness of cognitive-behavioral therapy with an average effect size 1.15 in populations with brain injury (Waldron et al., 2012)
- A small study explored mindfulness-based cognitive therapy and demonstrated reduced symptoms of depression in 20 patients (Bedard et al., 2012

Pain

- Thorough evaluation with consideration of individual factors and symptom presentation should be emphasized
- Treatment depends on the etiology of the pain
  - Guidelines for TBI and pain suggest maximization of non-pharmacological interventions before medications are initiated
    - Heat
    - Ultrasound
    - Cryotherapy
    - Transcutaneous nerve stimulation
    - Relaxation or CBT may require modification for individuals with TBI but can be effective
- Focus on interventions that minimize side effects notable in TBI
  - Analgesic balms, acetaminophen, and NSAIDS are first line treatment for most types of pain
- Minimize medications that have the potential for abuse



mTBI: Headache Management



- Headache
  - Management is similar to conventional headache management
  - Medication treatment should be carefully prescribed to avoid sedation
  - Other contributors to headache require review
    - Associated neck or upper back injury
    - Medication use
    - Significant caffeine use
    - Sleep/fatigue
  - Pharmacotherapy can include NSAIDs, triptans, and prophylactic headache treatments

Substance Use Disorders

- Little specific literature exists for the mild TBI population for treatment of SUDs
- Recent randomized controlled trials have examined the effect of brief interventions to reduce alcohol use in individuals with moderate to severe TBI with little to no effect (Sander et al., 2012; Ponsford et al., 2012; Tweedy et al., 2012).
  - Trials were limited by small sample size
  - Interventions varied with respect to time since injury to implementation
- Specialty referral to a SUDs clinic with collaborative work on modification of treatments for individuals with brain injury is a general clinical recommendation.
  - No clear evidence supports this approach.

Thank You

TBI and PTSD Comorbidity in Returning Veterans

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VA Boston Healthcare System
VA National Center for PTSD

HSR & D Cyberseminar

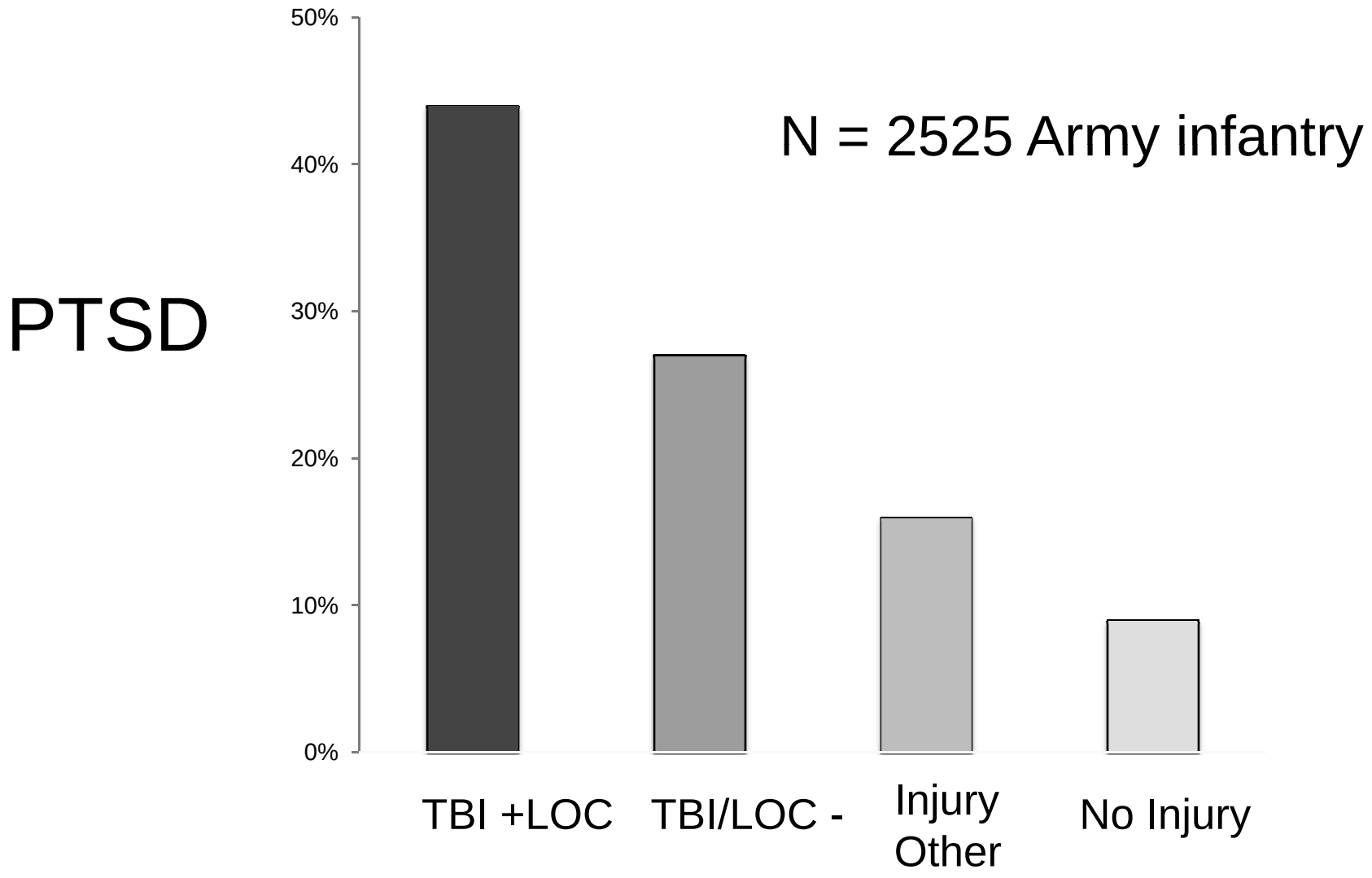
November, 2012

Overview

- Epidemiology
- Mechanisms leading to comorbidity
- Clinical Implications

Epidemiology

Hoge et al. (2008; *N Eng J Med*)

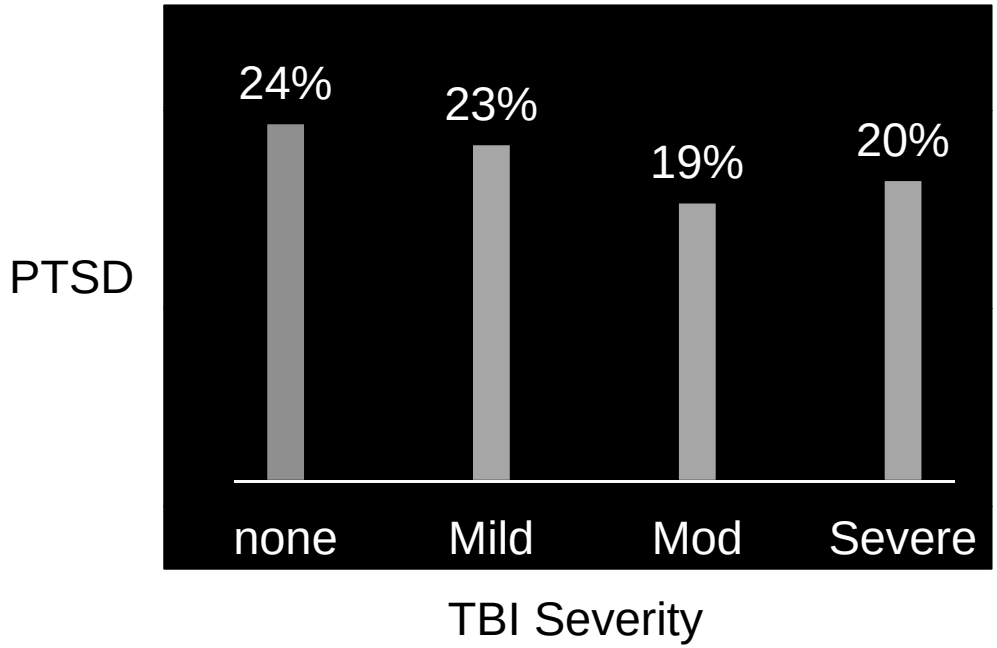


TBI Severity and PTSD

Zatzick et al. (2010; Arch Gen Psych)

N = 3047 civilians

- Only moderate and severe TBI decreased risk of PTSD, compared to other injury controls



- PTSD assoc. with functional impairment, cognitive symptoms.

Mechanisms

TBI/PCS

Stress/
PTSD

PTSD → TBI Recovery

- Most post-concussive symptoms in OEF/OIF sample can be accounted for by PTSD (Hoge et al, *N Eng J Med*, 2008)

- Psychiatric symptoms reduce resilience and coping with TBI

- Somatic pre-occupation (especially for anxiety disorders)

TBI → PTSD: Mechanisms

- TBI and associated complications can be stressful
- Cumulative effects of brain (and cognitive) dysfunction

Longitudinal Prediction of Psychiatric Status Following TBI

- Bryant et al. (2010; Am J Psych)

n = 1084 civilians with traumatic injuries

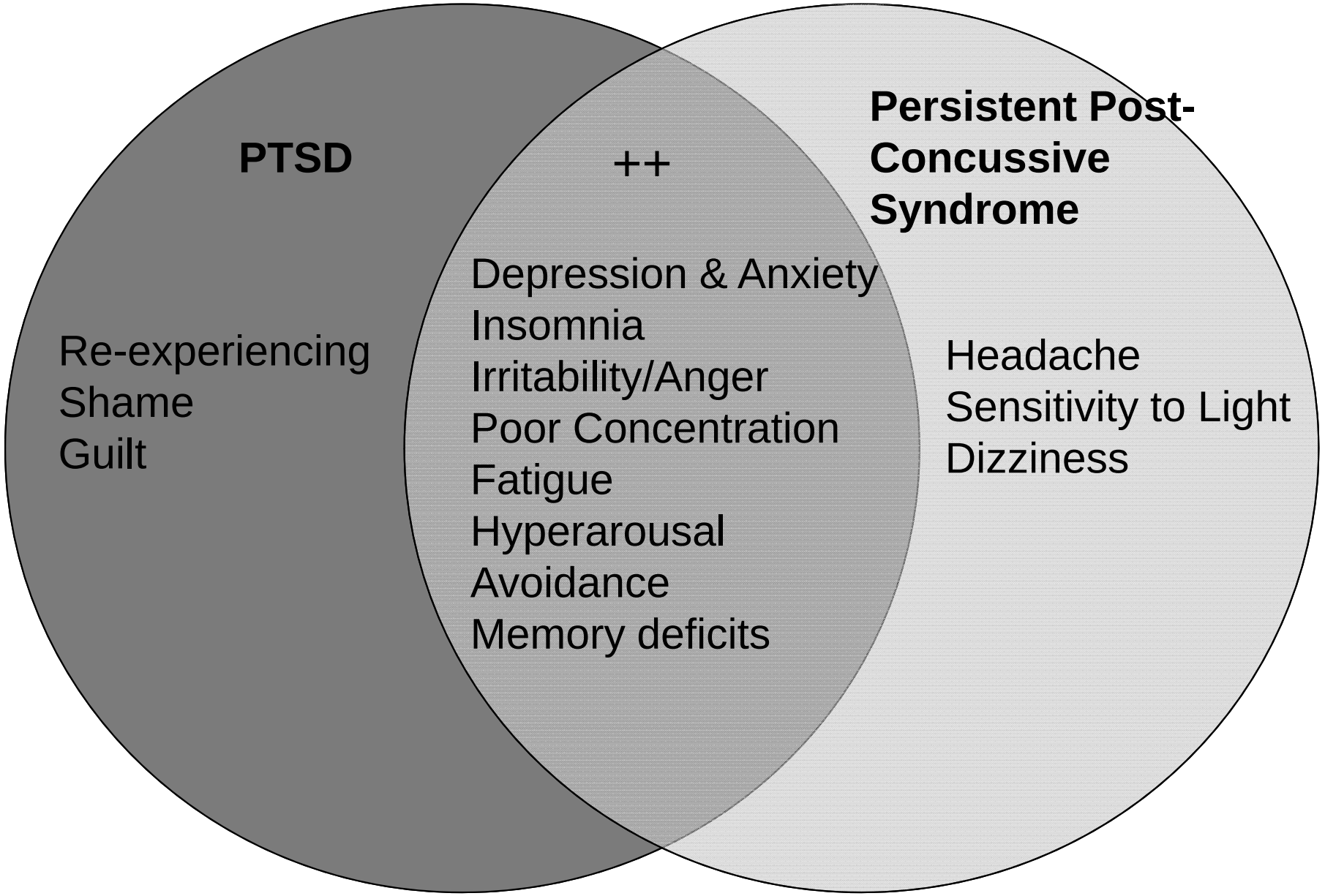
At 12 mos., mild TBI patients ~2x more likely to develop new:

	Adj OR	CI
PTSD	1.92	1.08, 3.40
Panic	2.10	1.03, 4.14
Social Phobia	2.07	1.03, 4.16
Agoraphobia	1.94	1.13, 3.39

Functional impairment related to psychiatric status.

Clinical Considerations

Overlapping Associated Symptoms



Adapted from: Stein & McAllister (2009*). Am J Psychiatry:* 166, 768-776

Table DS3 Results of hierarchical regression analyses examining associations of inter-session traumatic brain injury (TBI), post-dep post-deployment CES-D summary scores (Model 2) with functional and neuropsychological performance outcomes[a]

	Model 1					
	TBI (unadjusted for PTSD or depression symptom severity)		TBI adjusted for PCL-C summary scores		PCL-C summary scores adjusted for TBI	
Outcome variable	*B* (95% CI)	*P*	*B* (95% CI)	*P*	*B* (95% CI)	*P*
Functional outcomes						
MOS-CF	−0.02 (−0.08 to 0.05)	0.61	0.05 (−0.01 to 0.10)	0.11	−0.51 (−0.56 to −0.45)	<0.001
VR-12 – physical symptoms	−0.12 (−0.19 to −0.06)	<0.001	−0.10 (−0.17 to −0.03)	0.003	−0.17 (−0.24 to −0.10)	<0.001
Attention, working memory, executive						
Trailmaking, B–A	0.03 (−0.04 to 0.07)	0.46	0.02 (−0.05 to 0.09)	0.51	0.02 (−0.05 to 0.09)	0.65
CPT commission errors (log-transformed)	−0.03 (−0.10 to 0.04)	0.40	−0.03 (−0.10 to 0.03)	0.34	0.03 (−0.04 to 0.10)	0.35
CPT omission errors (log-transformed)	0.03 (−0.04 to 0.10)	0.38	0.02 (−0.05 to 0.09)	0.58	0.08 (0.01 to 0.15)	0.02
Learning and memory						
Verbal paired associates, learning trials, total correct	−0.01 (−0.07 to 0.04)	0.62	−0.01 (−0.06 to 0.05)	0.87	−0.07 (−0.13 to −0.02)	0.01
Verbal paired associates, % retention	−0.002 (−0.071 to 0.067)	0.95	−0.001 (−0.072 to 0.070)	0.97	−0.01 (−0.08 to 0.06)	0.83
Visual reproductions, immediate recall	−0.05 (−0.12 to 0.01)	0.09	−0.04 (−0.10 to 0.02)	0.18	−0.09 (−0.15 to −0.03)	0.005
Visual reproductions, % retention	−0.08 (−0.15 to −0.01)	0.03	−0.07 (−0.14 to 0.00)	0.05	−0.07 (−0.14 to 0.00)	0.05
Simple reaction time						
ANAM simple reaction time, throughput	0.03 (−0.04 to 0.09)	0.39	0.04 (−0.02 to 0.11)	0.19	−0.11 (−0.18 to −0.04)	0.001
Cognitive efficiency						
ANAM code substitution, learning throughput	0.02 (−0.03 to 0.07)	0.47	0.03 (−0.02 to 0.08)	0.24	−0.09 (−0.14 to −0.04)	0.001
ANAM code substitution, delay throughput	−0.003 (−0.054 to 0.048)	0.92	0.01 (−0.04 to 0.06)	0.68	−0.11 (−0.16 to −0.06)	<0.001
ANAM match to sample, throughput	0.03 (−0.03 to 0.08)	0.38	0.03 (−0.03 to 0.09)	0.27	−0.05 (−0.11 to 0.01)	0.07
ANAM math processing, throughput	−0.03 (−0.08 to 0.03)	0.35	−0.02 (−0.08 to 0.04)	0.45	−0.04 (−0.09 to 0.02)	0.19
ANAM running memory, throughput	0.003 (−0.054 to 0.060)	0.90	0.01 (−0.07 to 0.05)	0.77	−0.04 (−0.10 to 0.02)	0.19

Vasterling et al. (2012). *British Journal of Psychiatry*

Clinical Assessment Implications

- Potentially difficult to differentiate etiological factors based on symptoms and neuropsychological tests

- Determining course of symptoms might be informative

- Assessments might be better used to help identify symptoms that require clinical attention

Co-morbid TBI: Can I Treat PTSD as Usual?

- Does TBI contraindicate PTSD treatment?

  Probably not except under special circumstances, but little data on this

  (Chard et al., 2011, J Trauma Stress; Wolf et al., 2012, J Head Trauma Rehab)

- Does TBI influence treatment response?

  Unknown, but possibly if there is cognitive impairment

  (Wild & Gur, 2008; Br J Psychiatry)

Treatment: Bryant et al. (2003)

- Randomized Controlled Trial
- Cognitive Behavioral Therapy (CBT) for acute stress disorder after mild TBI
- CBT was associated with reduced PTSD 6 months later

Treatment Recommendations

- Address cognitive deficits causing functional impairment: don’t worry about etiology.

- No evidence that PTSD treatment is contraindicated in mild TBI.

- If mild TBI, treat PTSD as usual but allow for attenuated response.

- Proceed more cautiously with standard PTSD treatment if more severe TBI.

Suicide and Traumatic Brain Injury: US Military and Department of VA

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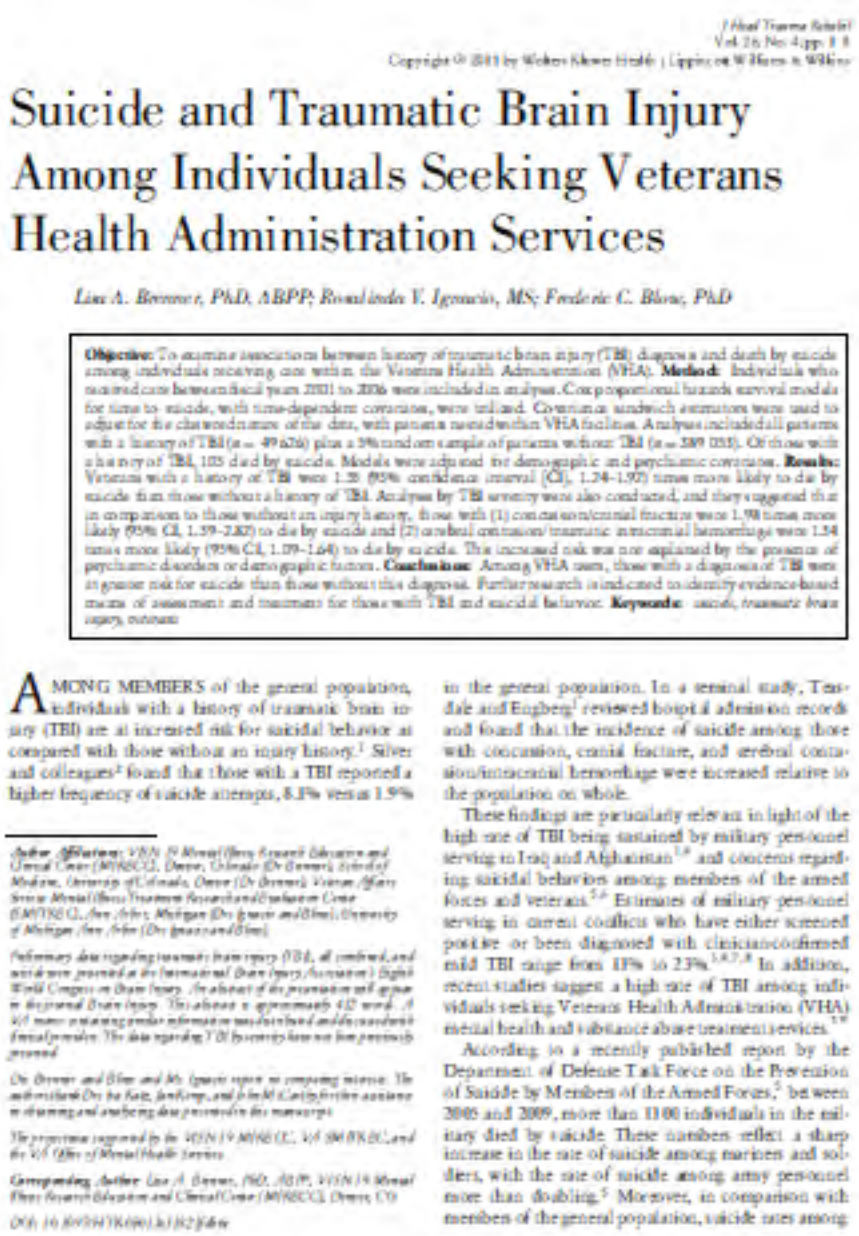
Disclosure

This presentation is based on work supported, in part, by the Department of Veterans Affairs, but does not necessarily represent the views of the Department of Veterans Affairs or the United States Government.

"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



Suicide and Traumatic Brain Injury Among Individuals Seeking Veterans Health Administration Services

Lisa A. Brenner, PhD, ABPP; Rosalinda V. Ignacio, MS; Frederic C. Blow, PhD

Objective: To examine associations between history of traumatic brain injury (TBI) diagnosis and death by suicide among individuals receiving care within the Veterans Health Administration (VHA). **Method:** Individuals who received care between fiscal years 2001 to 2006 were included in analyses. Cox proportional hazards survival models for time to suicide, with time-dependent covariates, were utilized. Covariance sandwich estimators were used to adjust for the clustered nature of the data, with patients nested within VHA facilities. Analyses included all patients with a history of TBI (n = 49,626) plus a 5% random sample of patients without TBI (n = 389,053). Of those with a history of TBI, 105 died by suicide. Models were adjusted for demographic and psychiatric covariates. **Results:** Veterans with a history of TBI were 1.35 (95% confidence interval [CI], 1.74–1.97) times more likely to die by suicide than those without a history of TBI. Analyses by TBI severity were also conducted, and they suggested that in comparison to those without an injury history, those with (1) concussion/cranial fracture were 1.98 times more likely (95% CI, 1.39–2.82) to die by suicide and (2) cerebral contusion/traumatic intracranial hemorrhage were 1.34 times more likely (95% CI, 1.09–1.64) to die by suicide. This increased risk was not explained by the presence of psychiatric disorders or demographic factors. **Conclusions:** Among VHA users, those with a diagnosis of TBI were at greater risk for suicide than those without this diagnosis. Further research is indicated to identify evidence-based means of assessment and treatment for those with TBI and suicidal behavior. **Keywords:** suicide, traumatic brain injury, veterans

Individuals who received care between FY 01 and 06

Analyses included all patients with a history of TBI (n = 49, 626) plus a 5% random sample of patients without TBI (n = 389,053)

Suicide - National Death Index (NDI) compiles death record data for all US residents from state vital statistics offices

TBI diagnoses of interest were similar to those used by Teasdale and Engberg

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Suicide by TBI Severity – VHA Users FY 01-06

- 12,159 with concussion or cranial fracture, of which 33 died by suicide
- 39,545 with cerebral contusion/traumatic intracranial hemorrhage of which 78 died by suicide
- Of those with a history of TBI, 105 died by suicide

Challenges associated with this type of research and need for collaboration (~8 million records reviewed)

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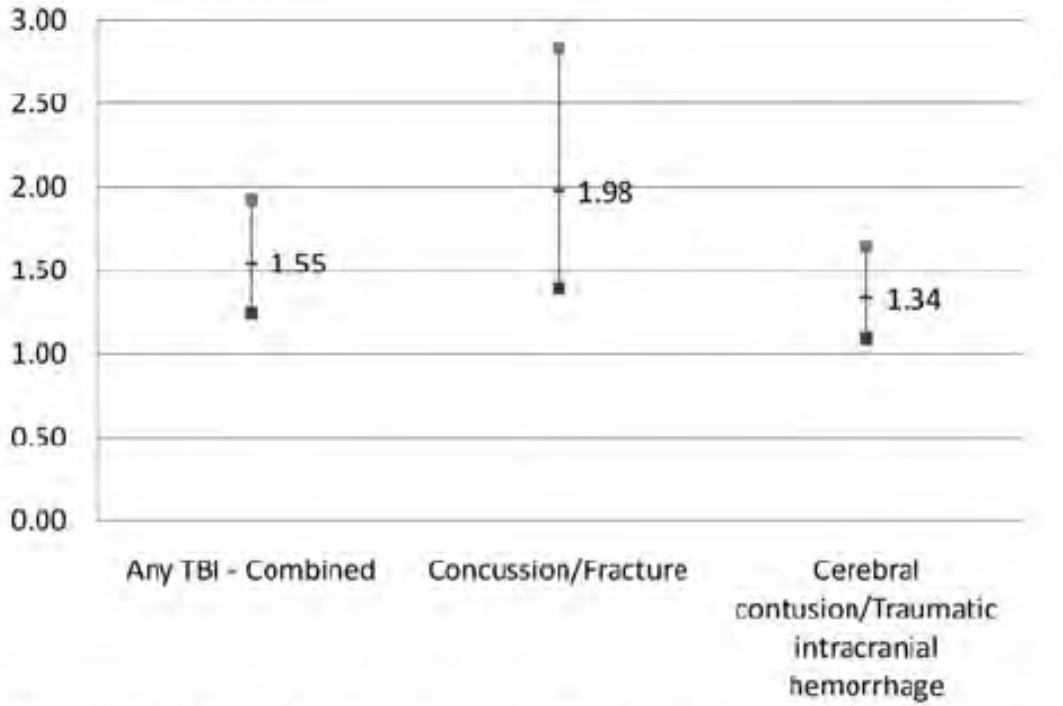

Figure 2. Hazard ratios for suicide by traumatic brain injury severity adjusted for sex, age, and psychiatric conditions.

ICD-9 codes:
1) concussion (850), cranial fracture—fracture of vault of skull (800), fracture of base of skull (801), and other and unqualified skull fractures (803)
(2) cerebral laceration and contusion (851); subarachnoid, subdural, and extradural hemorrhage after injury (852); other and unspecified intracranial hemorrhage after injury (853); and intracranial injury of other and unspecified nature (854).

Cox proportional hazards survival models for time to suicide, with time-dependent covariates, were utilized. Covariance sandwich estimators were used to adjust for the clustered nature of the data, with patients nested within VHA facilities.

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Diagnosis	All		Those who died by suicide		Those who did not die by suicide		
	N	Col%	*N*	Col%	*N*	Col%	*P*
VHA users with any TBI (combined)							
All	49 626	100	105	100	49 521	100	
Substance abuse	8368	16.86	32	30.48	8336	16.83	.0002
Bipolar I/II	2265	4.56	10	9.52	2255	4.55	.0292
MDD	4,464	9	24	22.86	4440	8.97	<.0001
Other depression, no MDD	7616	15.35	23	21.9	7593	15.33	.062
Other anxiety	4326	8.72	16	15.24	4310	8.7	.0177
PTSD	4880	9.83	23	21.9	4857	9.81	<.0001
Schizophrenia/schizoaffective disorder	2287	4.61	6	5.71	2281	4.61	.4875
VHA users with concussion/fracture							
All	12 159	100	33	100	12 126	100	
Substance abuse	2087	17.16	9	27.27	2078	17.14	.123
Bipolar I/II	588	4.84	2	6.06	586	4.83	.6731
MDD	1198	9.85	10	30.3	1188	9.8	.00092
Other depression, no MDD	1831	15.06	7	21.21	1824	15.04	.3271
Other anxiety	1148	9.44	7	21.21	1141	9.41	.0316
PTSD	1376	11.32	7	21.21	1369	11.29	.0912
Schizophrenia/schizoaffective disorder	519	4.27	1	3.03	518	4.27	.9999
VHA users with cerebral contusion/traumatic intracranial hemorrhage							
All	39 545	100	78	100	39 467	100	
Substance abuse	6728	17.01	25	32.05	6703	16.98	.0004
Bipolar I/II	1802	4.56	8	10.26	1794	4.55	.0256
MDD	3490	8.83	17	21.79	3473	8.8	<.0001
Other depression, no MDD	6142	15.53	17	21.79	6125	15.52	.1263
Other anxiety	3377	8.54	11	14.1	3366	8.53	.0785
PTSD	3757	9.5	17	21.79	3740	9.48	.0002
Schizophrenia/schizoaffective disorder	1869	4.73	5	6.41	1864	4.72	.4199

ICD-9

J Head Trauma Rehabil
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AMONG MEMBERS of the general population, individuals with a history of traumatic brain injury (TBI) are at increased risk for suicidal behavior as compared with those without an injury history.[1] Silver and colleagues[2] found that those with a TBI reported a higher frequency of suicide attempts, 8.1% versus 1.9% in the general population. In a seminal study, Teasdale and Engberg[1] reviewed hospital admission records and found that the incidence of suicide among those with concussion, cranial fracture, and cerebral contusion/intracranial hemorrhage were increased relative to the population as a whole.

These findings are particularly relevant in light of the high rate of TBI being sustained by military personnel serving in Iraq and Afghanistan[3,4] and concerns regarding suicidal behaviors among members of the armed forces and veterans.[5,6] Estimates of military personnel serving in current conflicts who have either screened positive or been diagnosed with clinician-confirmed mild TBI range from 11% to 23%.[3,4,7,8] In addition, recent studies suggest a high rate of TBI among individuals seeking Veterans Health Administration (VHA) mental health and substance abuse treatment services.[9,10]

According to a recently published report by the Department of Defense Task Force on the Prevention of Suicide by Members of the Armed Forces,[5] between 2005 and 2009, more than 1100 individuals in the military died by suicide. These numbers reflect a sharp increase in the rate of suicide among mariners and soldiers, with the rate of suicide among army personnel more than doubling.[5] Moreover, in comparison with

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Preliminary data regarding traumatic brain injury (TBI), all combined, and suicide were presented at the International Brain Injury Association's Eighth World Congress on Brain Injury. An abstract of the presentation will appear in the journal Brain Injury. This abstract is approximately 412 words. A VA memo containing similar information was distributed and discussed with clinical providers. The data regarding TBI by severity have not been previously presented.

Drs Brenner and Blow and Ms Ignacio report no competing interests. The authors thank Drs Ira Katz, Jan Kemp, and John McCarthy for their assistance in obtaining and analyzing data presented in this manuscript.

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"Although findings suggested that increased risk for death by suicide was present for those across the injury severity continuum, further work is required to clarify whether those with concussion/cranial fracture versus cerebral contusion/ traumatic intracranial hemorrhage are unique populations.
It is likely that factors associated with increased risk vary depending on the severity of injury sustained. It may also be that preexisting factors contribute to a greater degree for a subset of the population (eg, those with concussion)."

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MSMR
MEDICAL SURVEILLANCE MONTHLY REPORT

Relations between Suicide and Traumatic Brain Injury, Psychiatric Diagnoses, and Relationship Problems, Active Component, U.S. Armed Forces, 2001-2009

Nancy A. Skopp, PhD; Lily Trofimovich, MS; COL Jamie Grimes, MD; Lynne Oetjen-Gerdes, PhD; Gregory A. Gahm, PhD

TABLE 3. TBI proportions by severity, gender, service, and age

TBI severity type (cases and controls)[a]						
	Severe	Moderate	Mild	Unclassified	None	Total
Cases	5 (0.3%)	25 (1.4%)	97 (5.5%)	2 (0.1%)	1,635 (92.7%)	1,764
Controls	11 (0.2%)	84 (1.2%)	323 (4.6%)	14 (0.2%)	6,586 (93.8%)	7,018
TBI severity type and gender (cases)						
	Severe	Moderate	Mild	Unclassified	None	Total
Male	5 (0.3%)	24 (1.4%)	91 (5.4%)	2 (0.1%)	1,574 (92.8%)	1,696
Female	0 (0%)	1 (1.5%)	6 (8.8%)	0 (0%)	61 (89.7%)	68
TBI by severity type and service (cases)						
	Severe	Moderate	Mild	Unclassified	None	Total
Army	1 (0.1%)	13 (1.7%)	52 (6.8%)	2 (0.3%)	698 (91.1%)	766
Navy	2 (0.6%)	5 (1.4%)	16 (4.6%)	0 (0%)	325 (93.4%)	348
Marine Corps	2 (0.7%)	3 (1.0%)	15 (5.1%)	0 (0%)	276 (93.2%)	296
Air Force	0 (0%)	4 (1.1%)	14 (4.0%)	0 (0%)	336 (95.0%)	354
TBI by severity type and age (cases)						
	Severe	Moderate	Mild	Unclassified	None	Total
<25	3 (0.2%)	14 (1.1%)	72 (5.7%)	2 (0.2%)	1,184 (92.9%)	1,275
25-29	1 (0.5%)	3 (1.4%)	15 (7.2%)	0 (0%)	190 (90.9%)	209
30-39	1 (0.4%)	7 (2.9%)	9 (3.8%)	0 (0%)	221 (92.9%)	238
40+	0 (0%)	1 (2.4%)	1 (2.4%)	0 (0%)	40 (95.2%)	42

[a]Cases, n=1,764; Controls, n=7,018

TABLE 4. Conditional logistic regression predicting suicide mortality

Effect	Odds ratio (95% confidence interval)
Mild TBI	1.1 (0.88 – 1.42)
Mood disorder	1.6 (1.37 – 1. 80)
Alcohol dependence	1.2 (0.92 – 1.45)
PTSD	1.1 (0.75 – 1.73)
Partner relationship problems	2.0 (1.51 – 2.63)
Family circumstance problems	2.0 (1.25 – 3.04)

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TABLE 5. Number of psychiatric comorbidities and odds of suicide mortality

Effect	Odds ratio (95% confidence interval)
1 vs. No psychiatric diagnosis	1.5 (1.3 – 1.7)
2 vs. No psychiatric diagnosis	1.9 (1.4 – 2.6)
3 vs. No psychiatric diagnosis	6.4 (2.7 – 15.0)

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"The different findings regarding the relationship between mild TBI and suicide risk may reflect important differences between the underlying populations and settings of the studies. For example, within civilian populations, TBIs, in general, appear to be associated with high risk behaviors (e.g., fighting, alcohol abuse) and psychopathology. 25-27 However, within military populations, TBIs may more commonly be associated with injuries that occur during training exercises or exposures to combat. This distinction may have meaningful implications. Among civilians, an association between mild TBI and suicide might be attributable to pre-existing personality characteristics and psychopathology that increase or mediate suicide risk."

Suicide Attempts Prevalence

Suicide attempts	Prevalence	Sample	Injury Severity	Timeframe	Country
Brooks in Eames et al. 1990	15%	45	Unknown	5 years	UK
Silver et al 2001	8.1%	361	Unknown	Lifetime	United States
Shavelle et al 2001	3%	2,320	Unknown	5 years	United States
Simpson & Tate 2002	18%	172	Severe	Post-injury	Australia
	25%	172	Severe	Lifetime	Australia
Anstey et al 2004	1.6%	428	Unknown	Previous 12 months	Australia

- 22 Subjects
- Total Number of Admissions: 114
- Median Number of Admissions: 3
- Range of Admissions: 1-20

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A Preliminary Investigation of Suicidality in Psychiatrically Hospitalized Veterans with Traumatic Brain Injury

Peter M. Gutierrez, Lisa A. Brenner, and Joseph A. Huggins

The objective of this study was to explore suicidal behaviors documented at time of discharge from acute psychiatric hospitalization. Data from 114 acute psychiatric admissions were reviewed for 22 veterans with a history of traumatic brain injury (TBI). Information extracted included presence of suicidal ideation, nature of suicide attempts, and TBI characteristics. The Lethality of Suicide Attempt Rating Scale was used to classify veterans' non-lethal self-harm behavior. Post-TBI, 6 patients (27.3%) made a total of 14 suicide attempts. Half of those attempts required wounds being sutured, stomach lavage, or other medical attention. Clinicians and researchers are strongly encouraged to focus increased attention on suicide prevention in those with a history of TBI.

Keywords suicide, traumatic brain injury, veterans

Suicidal behavior has been identified as a significant problem among those with a history of traumatic brain injury (TBI). Simpson and Tate (2002) found that 23% of individuals with TBI receiving outpatient services endorsed suicidal ideation. TBI survivors also have a significantly higher rate of suicide attempts than those without such injuries (Silver, Kramer, Greenwald et al. 2001; Simpson & Tate, 2007). In a sample of individuals with mild, moderate, and severe injury, an 8.1% post-TBI lifetime rate of suicide attempts was identified, as compared with 1.9% for the general population (Silver, Kramer, Greenwald et al., 2001). Simpson and Tate (2002) reported that of those receiving outpatient services for TBI, 10.4% had pre-injury and 17.4% had post-injury suicide attempts. Individuals with a history of TBI also die by suicide more frequently than members of the general population (Teasdale & Engberg, 2001). Rates of suicide have been found to be 3.0, 2.7, and 4.1 times higher than the population on whole, depending on the type of injury sustained (i.e., concussion, cranial fracture, or cerebral contusion or traumatic intracranial hemorrhage respectively) (Teasdale & Engberg, 2001).

A possible neuropsychiatric mechanism underlying both the acquisition of TBI and risk for engaging in suicidal behavior is executive dysfunction (Fann, Leonetti, Jaffe et al., 2002; Jollant, Bellivier, Leboyer et al., 2005). The associated brain area

Are individuals with moderate to severe TBI seeking traditional psychiatric services?

TABLE 2. **Characteristics of Most Recent Traumatic Brain Injuries**

Variable	N	%
Severity		
Mild	1	4.5
Moderate	11	50
Severe	10	45.5
Mechanism of Injury		
Assault	6	27.3
MVA	4	18.2
Falls	3	13.6
Other Accidents	3	13.6
Explosion	2	9.1
MCA	2	9.1
Other[1]	2	9.1

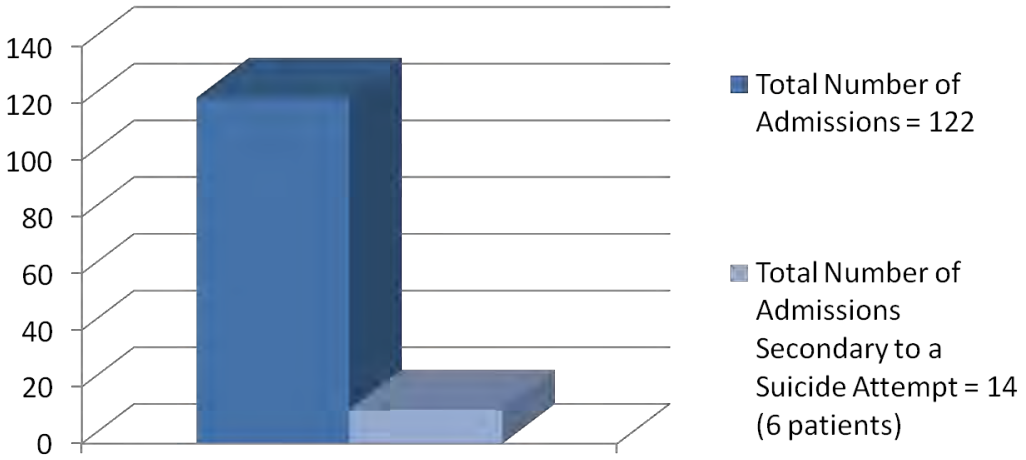
[1]Pedestrian hit by car, suicide attempt; MVA = motor vehicle accident, MCA = motorcycle accident.

TABLE 3. **Characteristics of Acute Psychiatric Hospitalizations**

Variable	%	Range (Mdn)
Number of hospitalizations per patient		1–20 (3)
Total Psychiatric Diagnoses Noted at Discharge[1]		
Substance Abuse	73	
Mood Disorder	59	
Psychosis	24	
Anxiety Disorder	21	
Organic Disorder[2]	26	
Length of Stay (Days)		0[3]–120 (11)

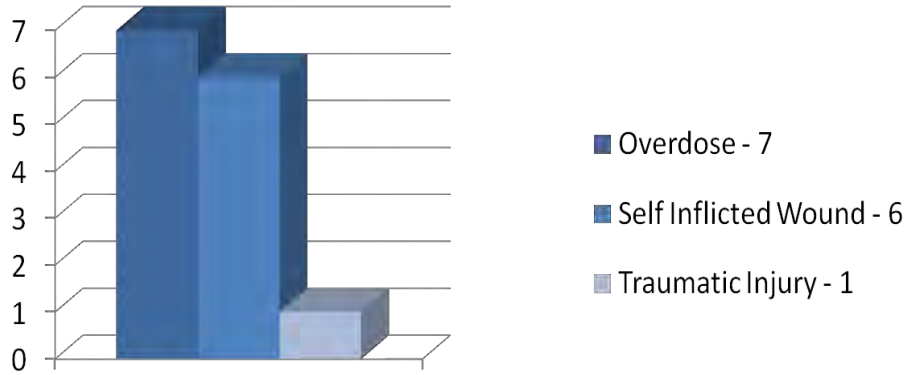
[1]Psychiatric diagnoses total to more than 100% due to the majority of patients receiving more than one diagnosis. [2]Includes dementia and mood disorders due to general medical condition. [3]Two patients were admitted and discharged on the same day.

Number of Admissions Secondary to a Suicide Attempt



"Half of the patients in the current study made suicide attempts by overdose, the majority using medications that were listed as being prescribed at time of discharge."

11% of total admissions
Number of attempts 1-5
Median - 2



Risk Factors

Suicide Risk Factors

Outcome	Domain	Adjusted Risk	95% CI
Suicide Attempt	Post-injury psychopathology High suicide ideation (BSS≥9) versus low/ no suicide ideation	4.9	1.79 – 13.17
	People with post-injury Psychiatric H'x/ Emotional distress versus none	7.8	2.11 – 29.04
Suicide ideation	Post-injury psychopathology Moderate/high levels of hopelessness (BHS≥9) versus minimal/no hopelessness	8.7	3.48 – 21.72
	People with post-injury Psychiatric H'x/ Emotional distress versus none	5.5	1.95 – 15.77
	Worthlessness versus no worthlessness	1.9	NR

- Hopelessness was found to be a strong independent predictor of suicidal ideation
- Suicidal ideation was a strong predictor of post-injury suicide attempts (Simpson & Tate, 2002)

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Hopelessness After TBI

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Suicidality after traumatic brain injury: demographic, injury and clinical correlates

GRAHAME SIMPSON[1] AND ROBYN TATE

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- Hopelessness common after severe TBI
- 35% rate of moderate to severe hopelessness was observed among people with TBI between 1 and 10 years post-injury (Simpson & Tate, 2002)

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Suicidality and Veterans With a History of Traumatic Brain Injury: Precipitating Events, Protective Factors, and Prevention Strategies

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Objectives: To increase understanding regarding precipitating and preventative factors of suicidal behavior and to highlight past experiences and recommendations regarding services aimed at suicide prevention among Veterans with a history of traumatic brain injury (TBI). **Study Design:** Qualitative. **Participants:** Sample of 13 Veterans with a history of TBI, and a history of clinically significant suicidal ideation or behavior. **Method:** In-person interviews were conducted and data were analyzed using a hermeneutic approach. **Results:** Shared precipitants noted included loss-of-self post-TBI, cognitive sequelae, and psychiatric and emotional disturbances. Common protective factors noted included social supports, a sense of purpose regarding the future, religion and spirituality, and mental health care. Means of improving care were also identified (e.g., increasing the availability of services and mental health professionals' knowledge regarding TBI, providing more structured treatment). **Conclusions:** Findings highlight potential areas of importance in the assessment and treatment of suicidal Veterans with a history of TBI. Recommendations regarding means of improving care are also presented.

Keywords: suicide, traumatic brain injury, Veterans, qualitative

Populations identified as being at increased risk for suicidal behavior include Veterans (Kaplan, Huguet, McFarland, & Newsom, 2007) and individuals with a history of traumatic brain injury (TBI) (Simpson & Tate, 2007). Kaplan et al. (2007) found U.S. male military Veterans, age 18 and older, to be twice as likely to die by suicide as non-Veteran males. Depending on the type of injury sustained, suicide rates among individuals with a history of TBI are estimated to be between 2.7 and 4.0 times higher as compared to the general population (Teasdale & Engberg, 2001). Findings by Silver, Kramer, Greenwald, and Weissman (2001) support an 8.1% lifetime risk of suicide attempts post-TBI (mild, moderate, and severe) compared with 1.9% for the general population. Finally, clinically significant suicidal ideation has been identified in 21% to 22% of individuals with a history of TBI (Simpson & Tate, 2007). Nevertheless, limited research has been conducted regarding Veterans with a history of TBI and suicidal behaviors, communications, or thoughts. Increased understanding regarding precipitating and preventative factors associated with suicidal behavior among this high-risk population could be used to identify best assessment and treatment practices.

A recent report suggests that suicide is on the rise among Soldiers, with the year 2006 having the highest number of confirmed cases since 1980 (Lange, 2008). Members of the U.S. Army were asked about current suicidal thoughts, and approximately 1% of the total sample of those who served in Iraq (2,411 of 222,020) endorsed some suicidal ideation (Hoge, Auchterlonie, & Milliken, 2006). Moreover, 407 of the 222,020 indicated that they thought about suicide "a lot" (Hoge, Auchterlonie, & Milliken, 2006). As individuals transition from active duty to Veteran status, systems of health care also change. During the year 2009, 5,771,000 patients are expected to receive medical care within the Veterans Affairs (VA) system (Drake, 2008). This number includes approximately 333,000 Veterans who served in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) (Drake, 2008). The need for research regarding TBI and suicide is further supported by findings that suggest that the rate of TBI among military personnel

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Participants: Sample of 13 Veterans with a history of TBI, and a history of clinically significant suicidal ideation or behavior.

Method: In-person interviews were conducted and data were analyzed using a hermeneutic approach

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Cognitive Impairment and Suicidality

- “I knew what I wanted to say although I'd get into a thought about half-way though and it would just dissolve into my brain. I wouldn't know where it was, what it was and five minutes later I couldn't even remember that I had a thought. And that added to a lot of frustration going on….and you know because of the condition a couple of days later you can't even remember that you were frustrated.”

- “I get to the point where I fight with my memory and other things…and it’s not worth it.”

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Emotional and Psychiatric Disturbances and Suicidality

- I got depressed about a lot of things and figured my wife could use a $400,000 tax-free life insurance plan a lot better than….I went jogging one morning, and was feeling this bad, and I said "well, it's going to be easy for me to slip and fall in front of this next truck that goes by…"

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Loss of Sense of Self and Suicidality

- Veterans spoke about a shift in their self-concepts post-injury, which was frequently associated with a sense of loss
  - "…when you have a brain trauma…it's kind of like two different people that split…it's kind of like a split personality. You have the person that's still walking around but then you have the other person who's the brain trauma."

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Suicide and Life-Threatening BEHAVIOR

Suicide and Life-Threatening Behavior
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Posttraumatic Stress Disorder, Traumatic Brain Injury, and Suicide Attempt History among Veterans Receiving Mental Health Services

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History of posttraumatic stress disorder (PTSD) or traumatic brain injury (TBI) has been found to increase risk of suicidal behavior. The association between suicide attempt history among veterans with PTSD and/or TBI was explored. Cases (N = 81) and 2:1 matched controls (N = 160) were randomly selected from a Veterans Affairs Medical Center clinical database. PTSD history was associated with an increased risk for a suicide attempt (OR = 2.8; 95% CI: 1.5, 5.1). This increased risk was present for those with and without a history of TBI. Results support incorporating PTSD history when assessing suicide risk among veterans with and without TBI.

Suicide rates among patients receiving care in the Veterans Health Administration have been found to be significantly higher than in the general U.S. population (McCarthy et al., 2009). So far, data on the effect of psychiatric conditions, including posttraumatic stress disorder (PTSD), on history of suicide attempts and deaths among veterans has been sparse. In looking at death by suicide, Ballman and Kang (1994) found that Vietnam veterans with PTSD were at increased risk when compared with those without PTSD. Among members of the general population, Davidson, Hughes, Blazer, and George (1991) found that individuals with PTSD were approximately 15 times more likely to attempt suicide than those without PTSD, even after adjusting for demographic factors and depressive symptoms. Finally, Operation Enduring Freedom/Operation Iraqi Freedom veterans who screened positive for PTSD were over four times more likely to endorse suicidal ideation than those without PTSD (Jakupcak et al., 2009).

In addition to PTSD, history of traumatic brain injury (TBI) has been discussed as a frequently occurring condition among those serving in Iraq and Afghanistan (Brenner et al., 2010; Hoge et al., 2008). Although recent efforts have focused on identifying mental and physical health outcomes in those with PTSD and/or TBI (Brenner et al., 2010; Hoge, Terhakopian, Castro, Messer, & Engel, 2007; Hoge et al., 2008; Tanielian et al., 2008), studies regarding suicide in veterans with both conditions has been limited. This is

"The odds of a suicide attempt for those with both PTSD and TBI was 3.3 times the odds of an attempt for those with TBI alone."

Cases (N = 81) and 2:1 matched controls (N = 160) were randomly selected from a VAMC clinical database

PTSD history was associated with an increased risk for a suicide attempt (OR = 2.8; 95% CI: 1.5, 5.1)

This increased risk was present for those with and without a history of TBI

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Suicide Prevention After Traumatic Brain Injury: A Randomized Controlled Trial of a Program for the Psychological Treatment of Hopelessness

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Primary outcome measure: ↓ Hopelessness

Secondary outcome measures: ↓ Suicidal ideation and depression

↑ Hope, self-esteem, problem solving

Participants who completed the WtoH program would report a significant reduction in their levels of hopelessness compared to waitlist controls

Treatment group would demonstrate significant reductions in suicidal ideation and depression, and increased social problem-solving, self-esteem and hopefulness in comparison to the waitlist controls

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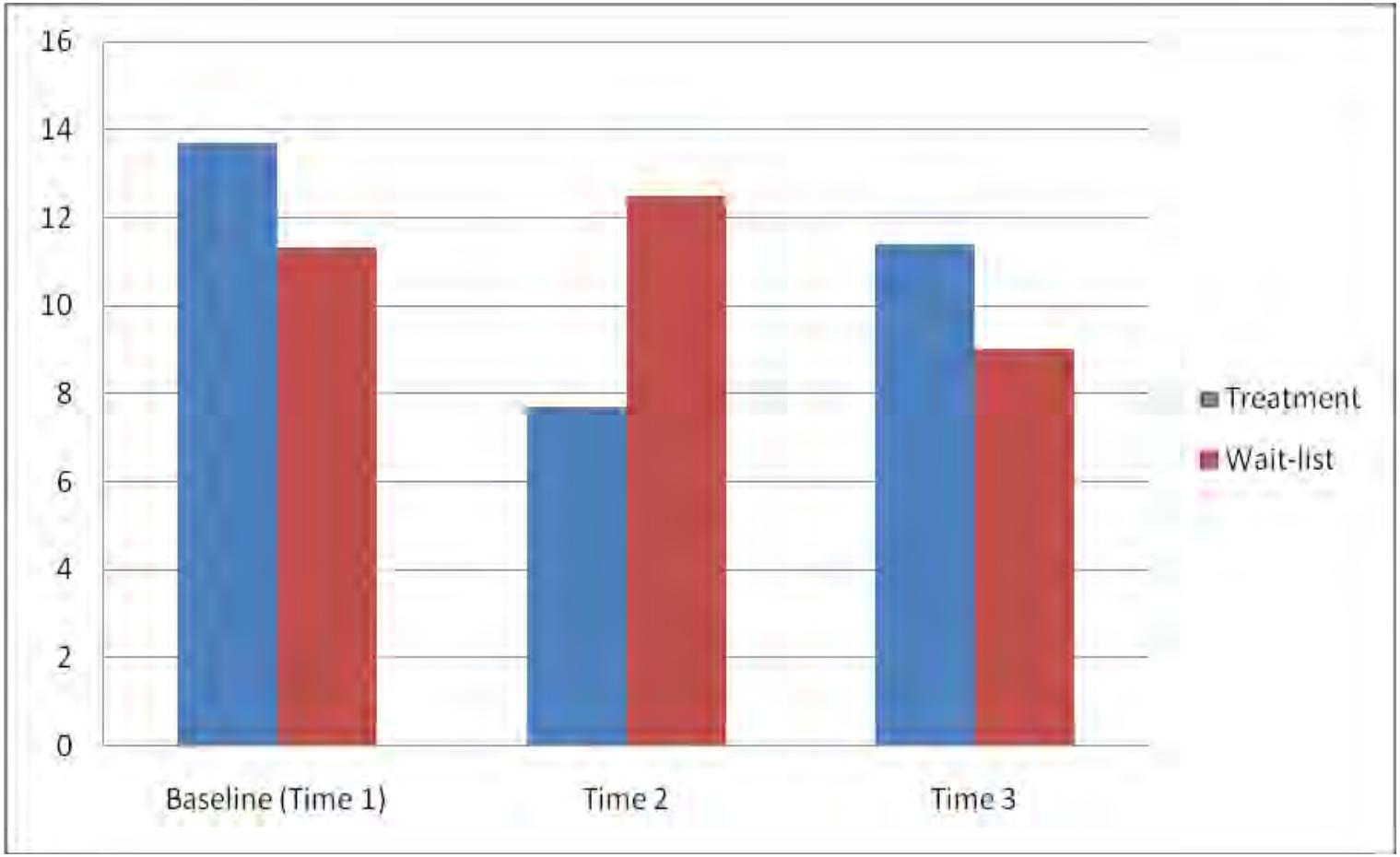
Hopelessness



$F_{(1,15)}$=13.20, p=0.002

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VA Window to Hope Team

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Window of Hope

Positive Lifestyle – EASE **Behavioral Activation** **E**ating **A**ctivity **S**leep **E**xercise	**Take Another Look** **Cognitive Restructuring** Stop Drop Roll
How to be a STAR **Problem Solving** **S**pot the problem **T**hink of options **A**ct on best option **R**eview how it went	**Building Hope** **Post Traumatic Growth** Self-esteem/ value Finding connection Sense of purpose Expect good things

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"…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. "

- VA Patient/TBI Survivor

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QUESTIONS?

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