Addressing the Mental Health Needs of Those with TBI: Evidence-Based Assessment and Treatment Strategies

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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

- 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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Injury Severity

Mild	**Moderate**	**Severe**
Altered or LOC<30 minutes with normal CT and/or MRI	LOC<6 hours with abnormal CT and/or MRI	LOC>6 hours with abnormal CT and/or MRI
GCS 13-15	GCS 9-12	GCS<9
PTA<24 hours	PTA<7 days	PTA>7days

Department of Veterans Affairs 2004

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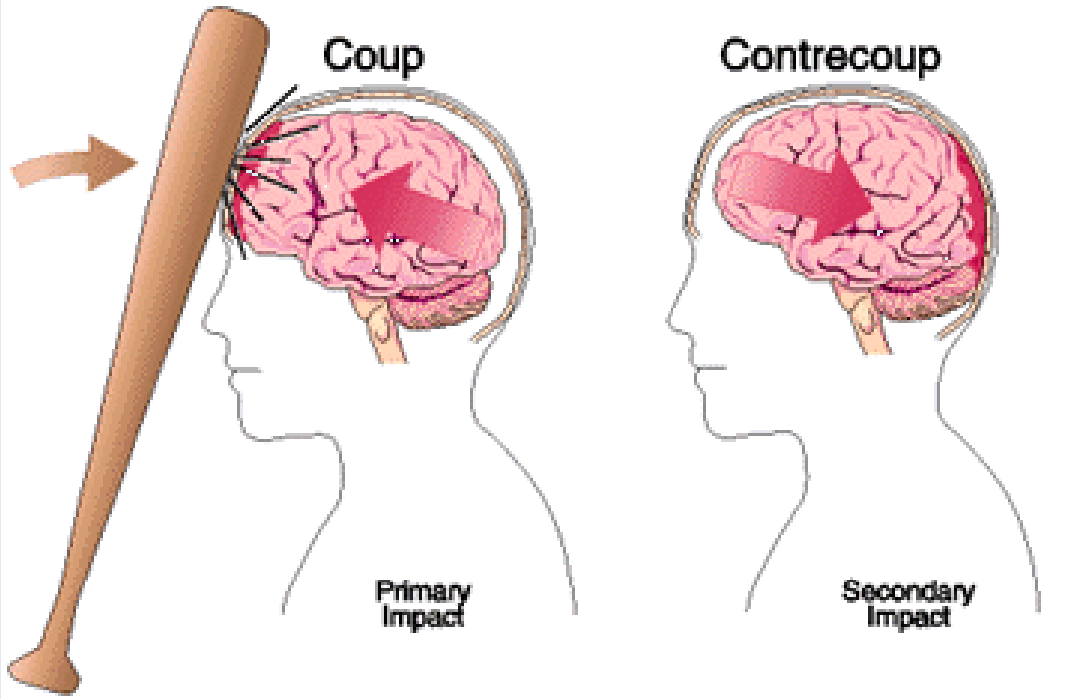
Common Mild TBI Symptoms

NOT to be confused with the injury itself

TBI is a historical event

Mechanism of Injury – Acceleration/Deceleration



John Kirk, Ph.D.

Thanks John Kirk, Ph.D.

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Blast Injury

- Blast injuries are injuries that result from the complex pressure wave generated by an explosion.
  - The explosion causes an instantaneous rise in pressure over atmospheric pressure that creates a blast overpressurization wave

- Air-filled organs such as the ear, lung, and gastrointenstinal tract and organs surrounded by fluid-filled cavities such as the brain and spinal are especially susceptible to primary blast injury

www.dvbic.org/blastinjury.html

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Blast Injury

- Primary – Barotrauma
- Secondary – Objects being put into motion
- Tertiary – Individuals being put into motion

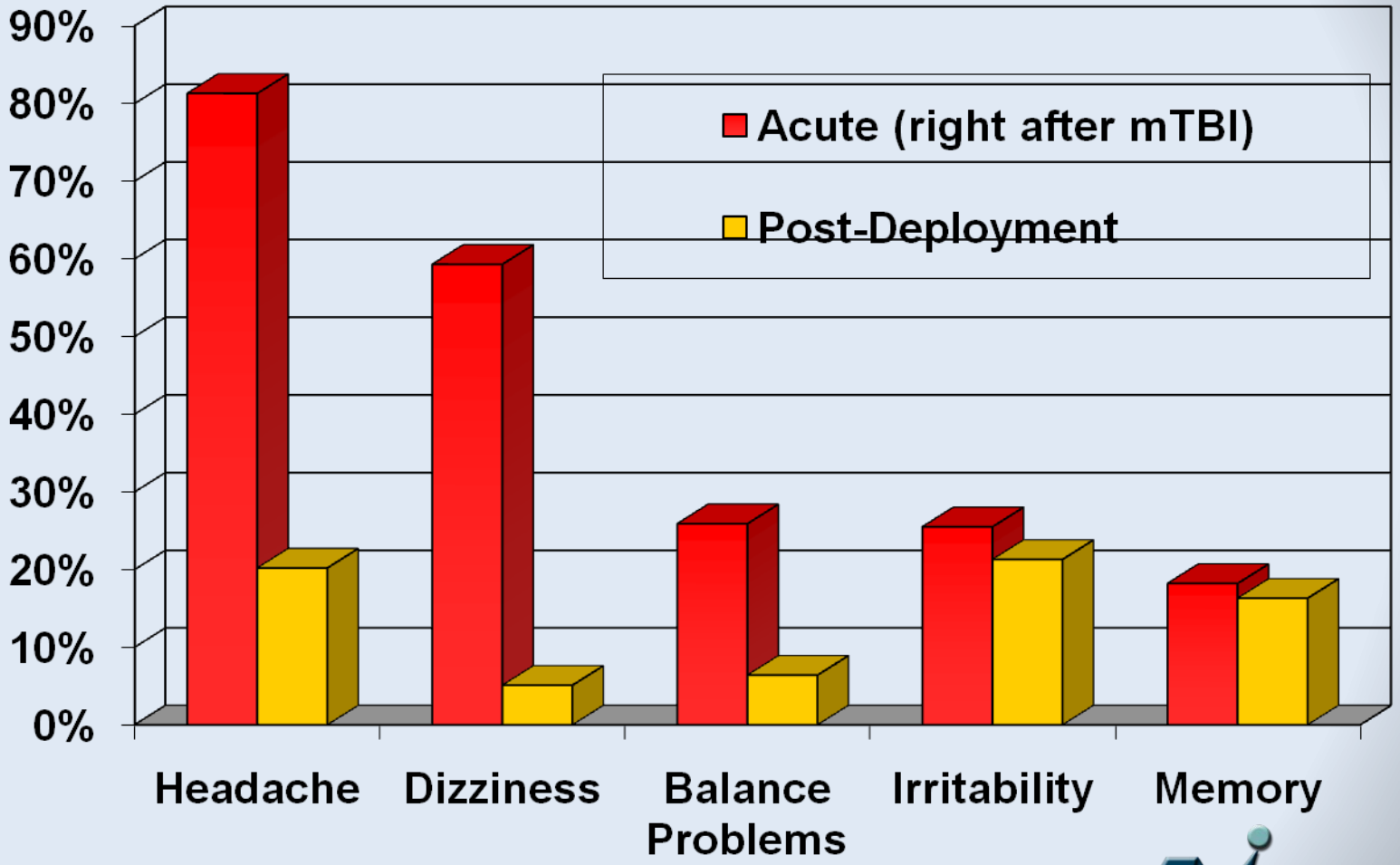
Screening Results: n=3,973

Injury Status	N (%)
Injured with TBI	907 (22.8)
Injured without TBI	385 (9.7)
Not injured	2,681 (67.5)
Total Screened	**3,973 (100)**
Injury Characteristics for Soldiers with TBI‡	
Dazed or confused only	572 (63.1)
Had LOC* or could not remember the injury	335 (36.9)
Total with TBI	**907 (100)**

‡ TBI is defined by an alteration in consciousness, such as being dazed or confused, not remembering the injury event, and/or losing consciousness in the context of an injury
* LOC=loss of consciousness

Terrio et al., 2009

Ft. Carson: Post-Deployment Data (n = 907)



Terrio H, Brenner LA, Ivins B, Cho JM, Helmick K, Schwab K, et al. Traumatic brain injury screening: Preliminary findings regarding prevalence and sequelae in a US Army Brigade Combat Team. Journal of Head Trauma Rehabilitation. 2009; 24(1):14-23.

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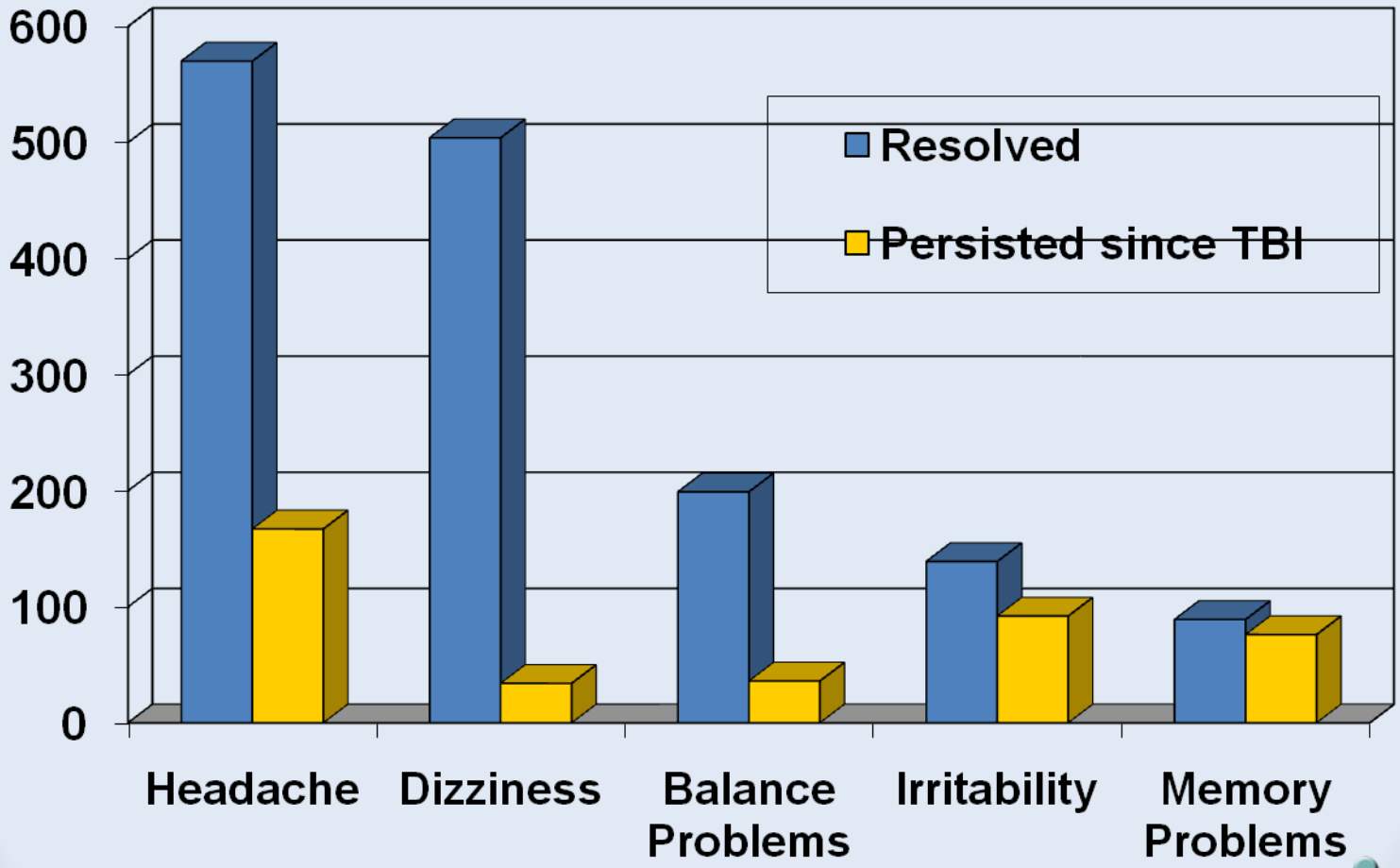
Symptoms Beginning at TBI Event: Course of Symptoms (n = 844)



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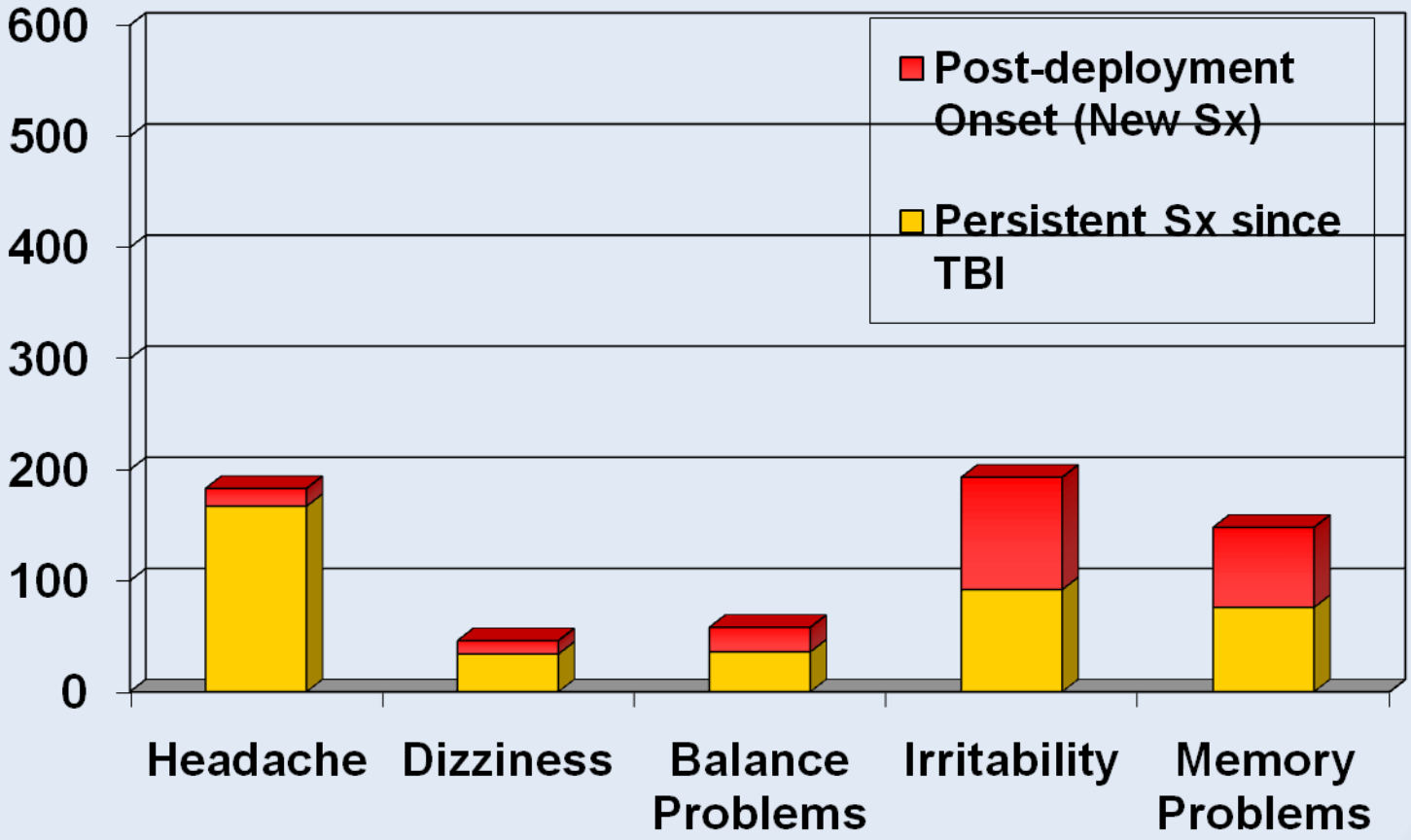
Currently Symptomatic: Onset of Symptoms (n = 844)



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“Does TBI confer additional risk of PTSD development or symptom exacerbation following psychological trauma exposure?”

If so, why?

Vasterling, Verfaille, & Sullivan, 2009

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PTSD – A Review

DSM-IV Criteria – PTSD Traumatic Event

The person has been exposed to a traumatic event in which both of the following have been present:

- (1) the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others (2) the person's response involved intense fear, helplessness, or horror.

APA 2000

DSM-IV Criteria - PTSD

B. Re-experiencing symptoms

(nightmares, intrusive thoughts)

C. Avoidance of trauma cues and Numbing/detachment from others

D. Hyperarousal (increased startle, hypervigilance)

Duration of the disturbance (symptoms in Criteria B, C, and D) is more than one month.

The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

APA 2000

Increased Rates of PTSD in those with Mild TBI

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

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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, 42.9% met criteria for post-traumatic stress disorder (PTSD), as compared with 27.3% of those reporting altered mental status, 16.2% with other injuries, and 9.3% 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.
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"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…"

Why?

- Impaired emotional regulation resulting from damage to the medial pre-frontal cortex
- Impaired cognitive strategies that limit management of emotional stress
- Additional stressors that occur after mTBI

Bryant, Creamer, O'Donnell, Silove, Clark, and McFarlane, 2009

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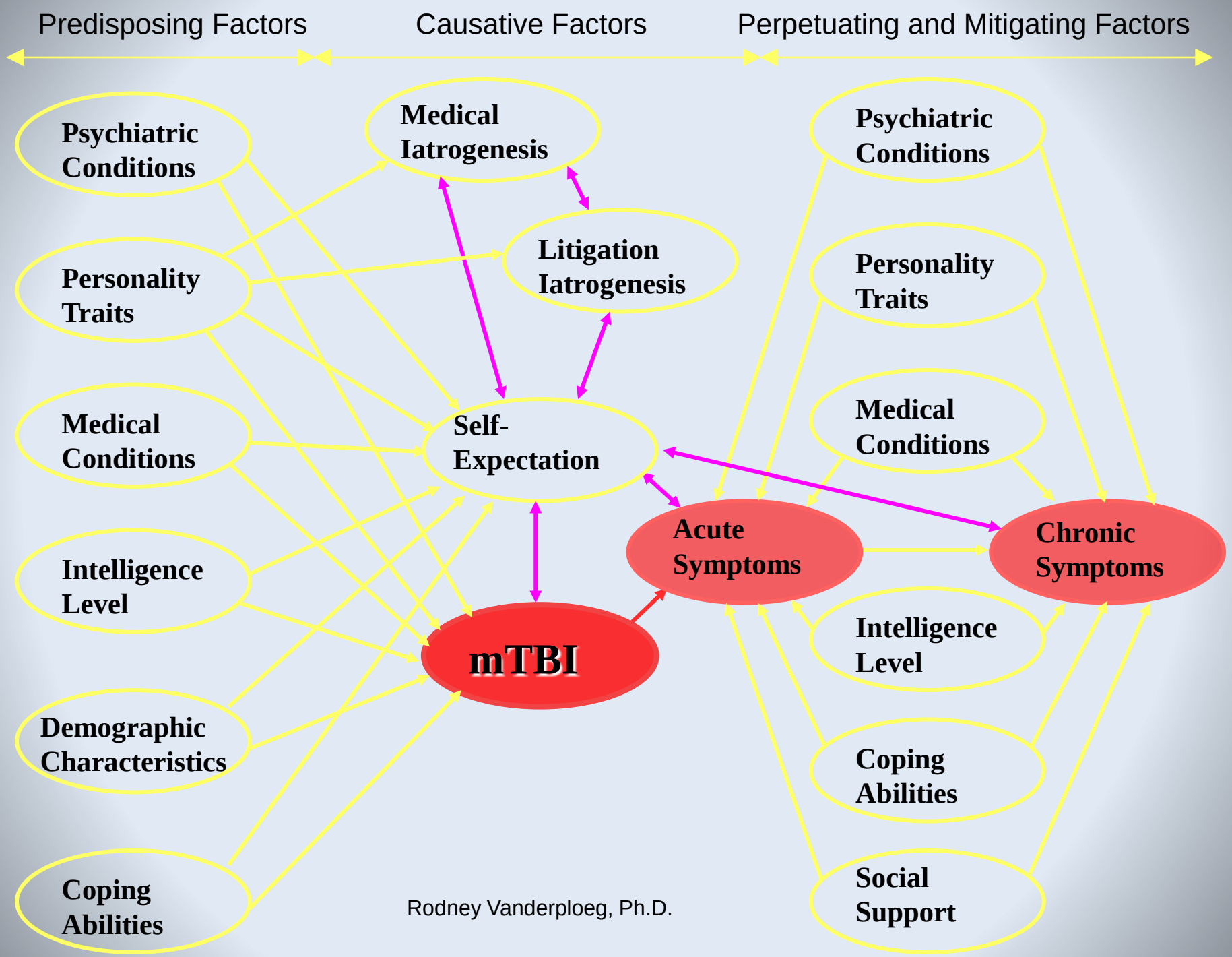
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Perpetuating and Mitigating Factors
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Personality Traits
Medical Conditions
Intelligence Level
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Litigation Iatrogenesis
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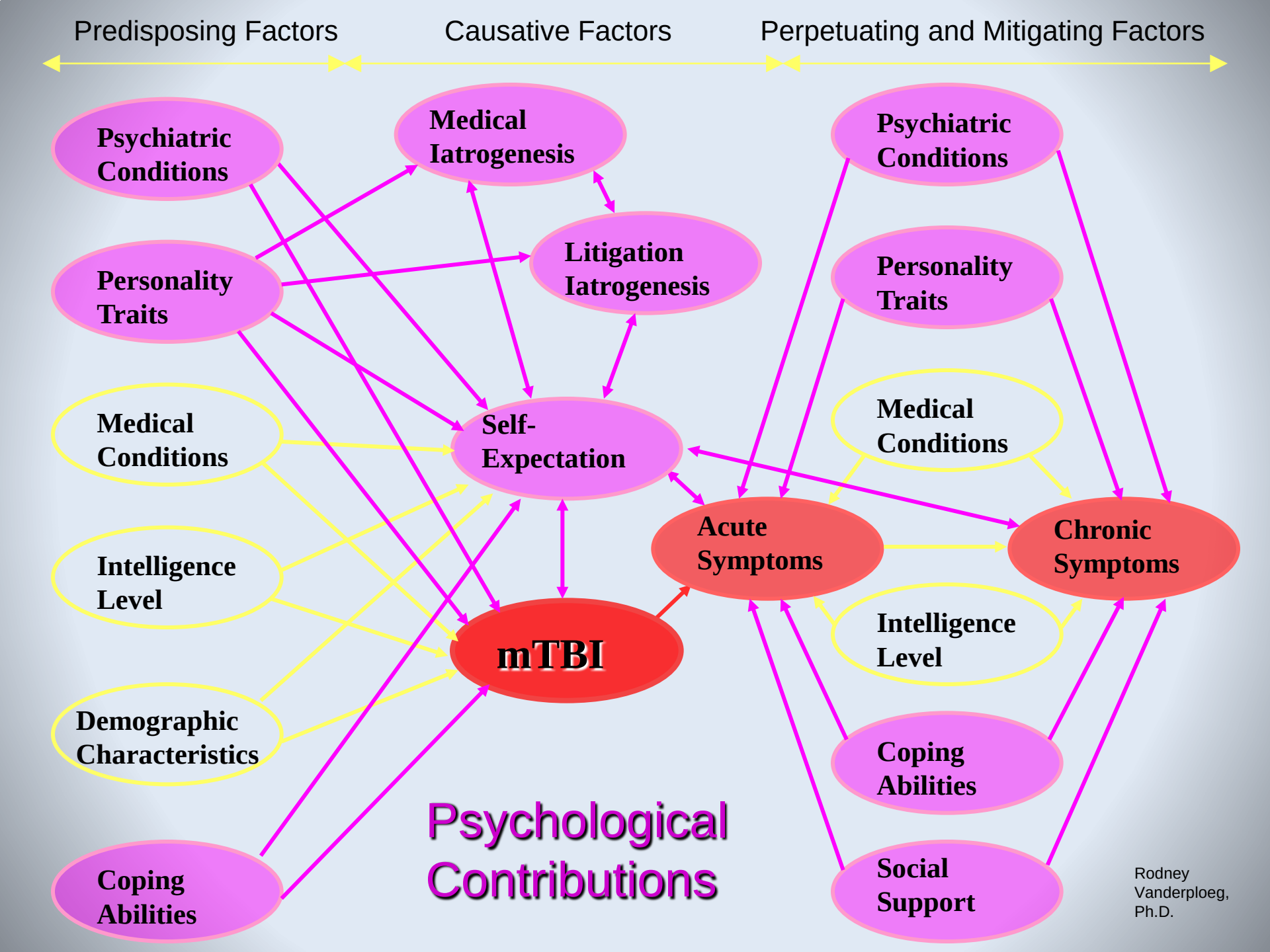
Rodney Vanderploeg, Ph.D.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Psychological Contributions
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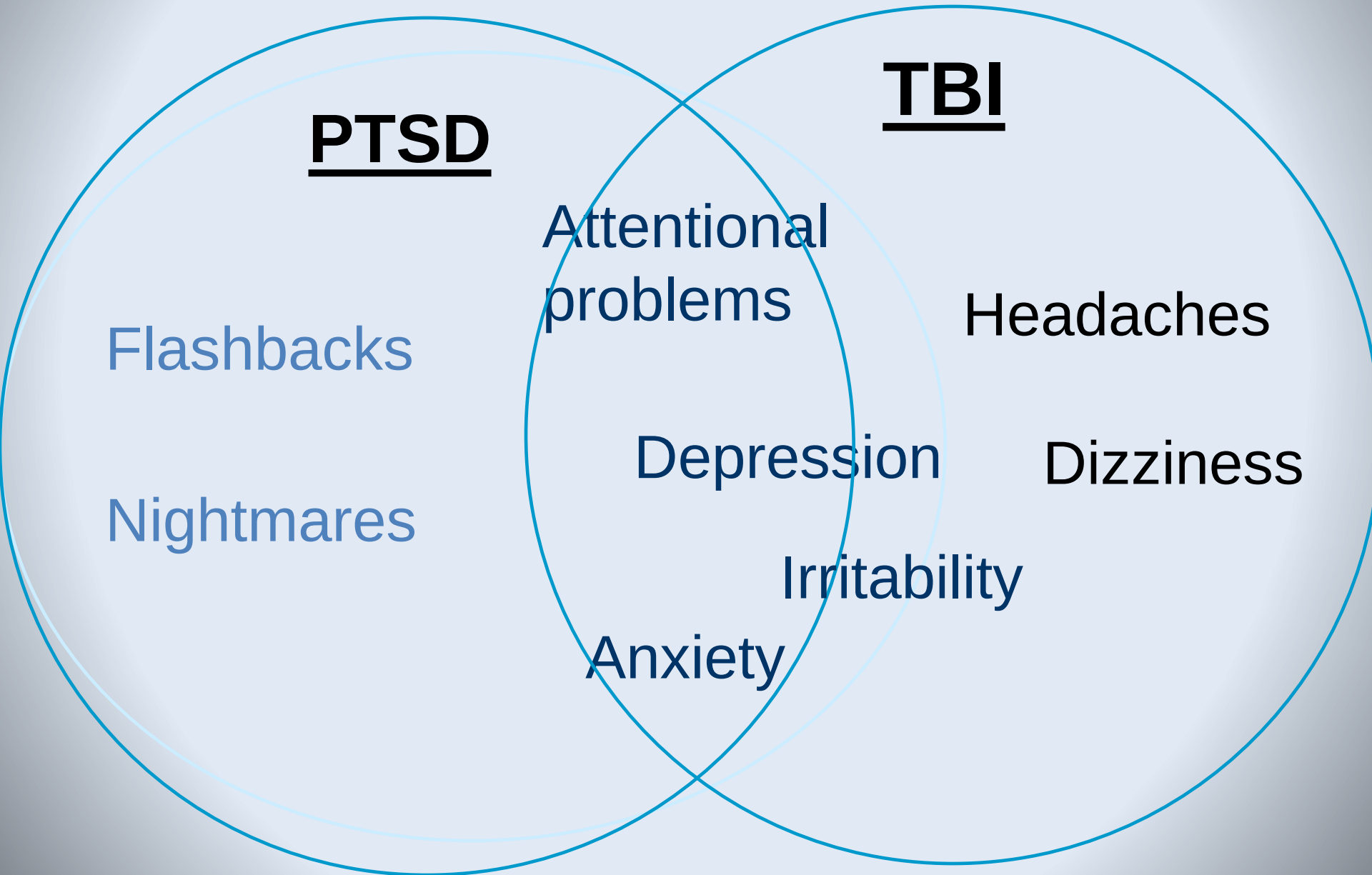
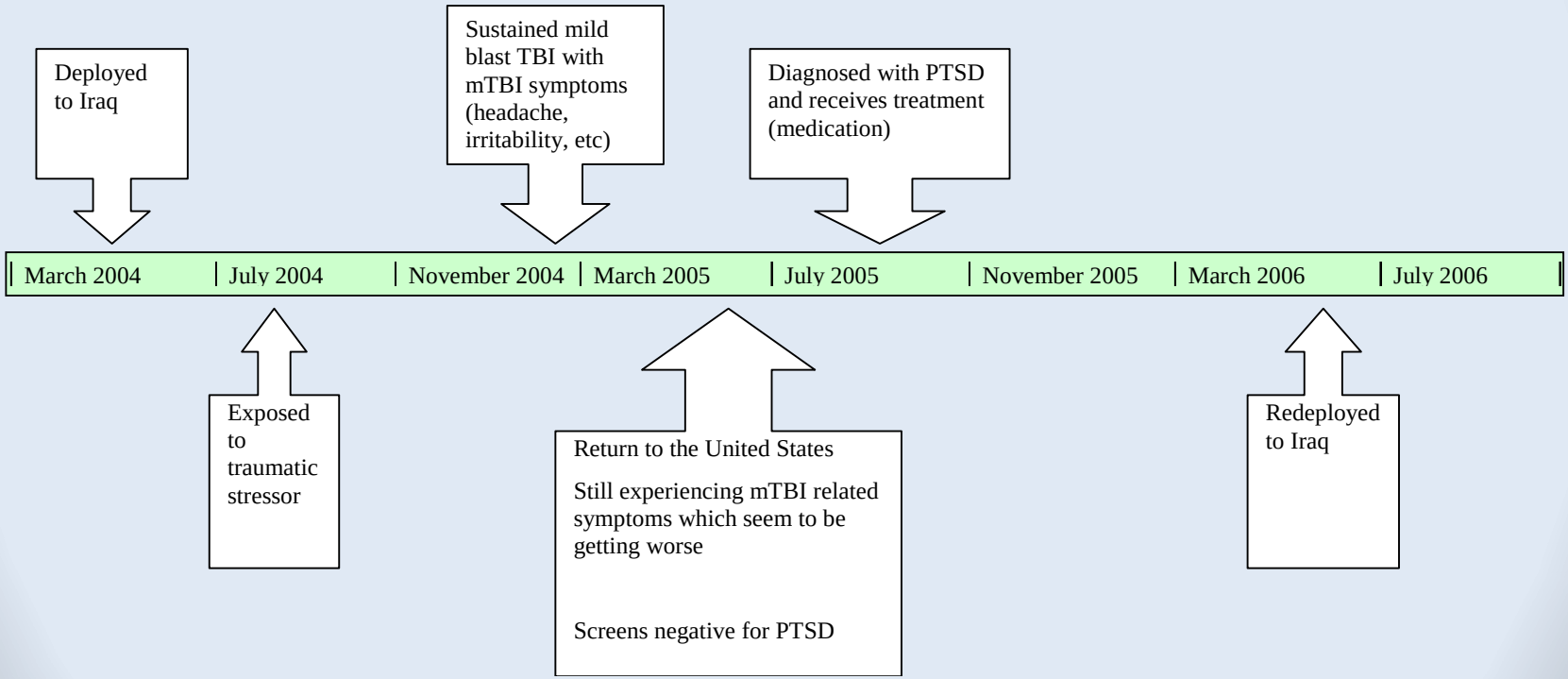
Potential Clinical Presentation



Case Example: Co-Occurring PTSD and mTBI



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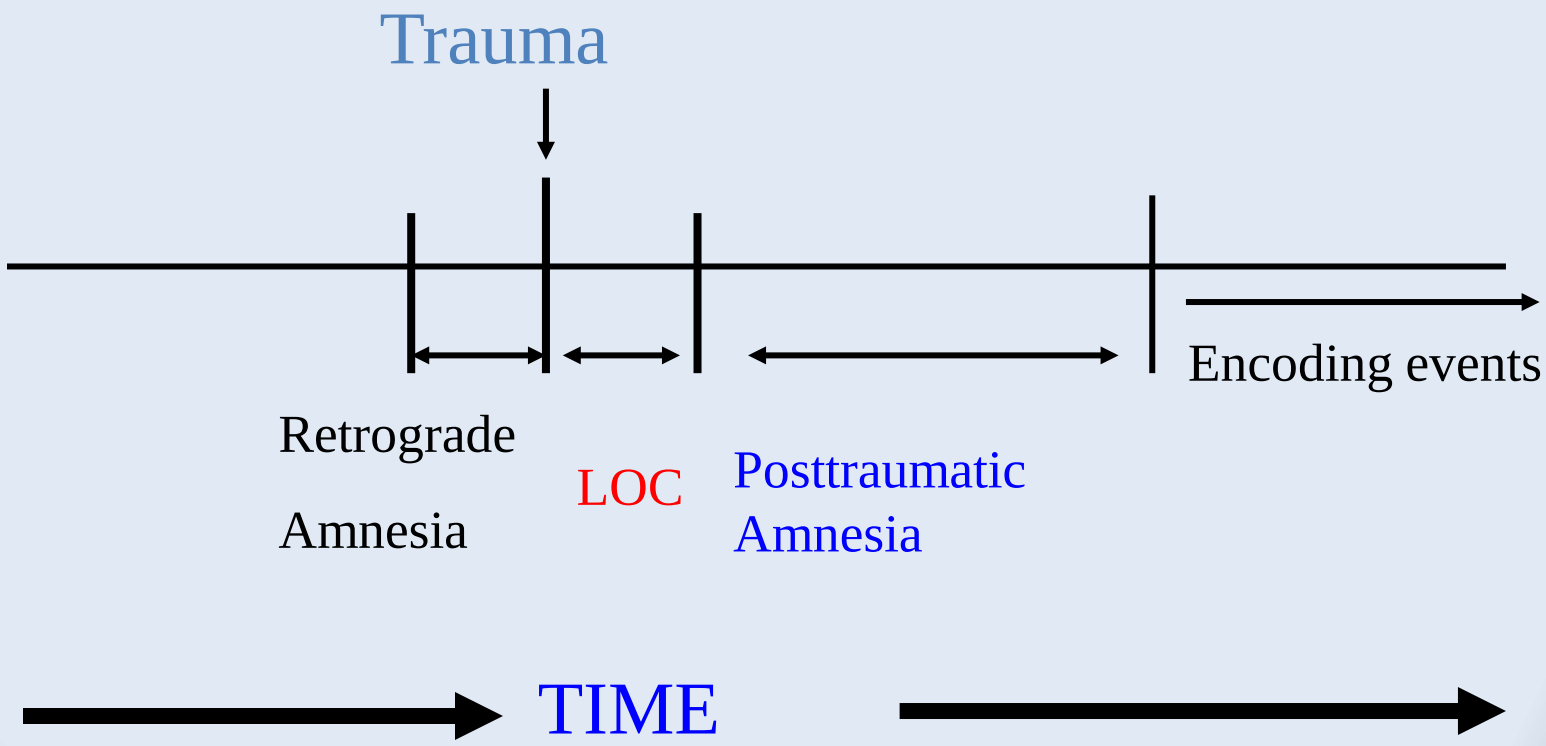
PTSD with Amnesia?

Why the controversy?



Thanks John Kirk, Ph.D.

mTBI and PTSD

- Prospective study of the relationship between TBI and PTSD
  - 120 subjects with mild TBI who were hospitalized for observation
  - Assessed immediately after accident, and at 1 week, 3 months, and 6 months
  - 17 subjects (14%) meet criteria at 6 months
    - Subjects with memory of the event were more likely to develop PTSD than those with no memory – Differences between the groups primarily resulted from the re-experiencing cluster

Analysis revealed that memory of the traumatic event within the first 24 hours was a strong predictor of PTSD at 6 months

Gil et al. 2005

PTSD after Severe TBI

- Patients with severe TBI (n=96) were assessed for PTSD at 6 months

PTSD diagnosed in 27.1% (n=26)

Bryant et al. 2000

Rates of PTSD Symptoms in Patients With and Without PTSD 6 Months After Severe Traumatic Brain Injury

	PTSD					
	Patients With (N=26)		Patients Without (N=70)		Predictive Power	
Symptom	N	%	N	%	Positive[a]	Negative[b]
Intrusive memories	5	19.2	0	0.0	1.00	0.77
Nightmares	6	23.1	0	0.0	1.00	0.78
Sense of reliving trauma	8	30.8	3	4.3	0.73	0.79
Emotional reactivity	25	96.2	4	5.7	0.86	0.98
Physiological reactivity	13	50.0	6	8.6	0.68	0.83
Avoidance of thoughts	17	65.4	15	21.4	0.53	0.86
Avoidance of places	17	65.4	14	20.0	0.55	0.86
Diminished interest	19	73.1	23	32.9	0.45	0.87
Detachment	19	73.1	24	34.3	0.44	0.91
Restricted affect	17	65.4	19	27.1	0.47	0.85
Sense of foreshortened future	19	73.1	23	32.9	0.45	0.87
Insomnia	18	69.2	17	24.3	0.51	0.87
Irritability	22	84.6	22	31.4	0.50	0.92
Concentration deficits	24	92.3	32	45.7	0.43	0.95
Hypervigilance	19	73.1	19	27.1	0.50	0.88
Startle response	19	73.1	11	15.7	0.63	0.89

[a] Probability of PTSD when symptom is present.
[b] Probability of absence of PTSD when symptom is absent.

Bryant et al. 2000

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Fear Conditioning

- Patients (n=68) with severe TBI
  - Resting heart rate assessed at one week and one month after injury
  - Assessed for PTSD at 6 months
- 23% of the sample met criteria for PTSD
- Those with PTSD had higher heart rates at 1 week (but not 1 month) after trauma

Researchers propose that "fear conditioning" can occur outside the level of awareness and contribute to the development of PTSD

Bryant et al. 2004

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Increased Rates of other mental health conditions in those with Mild TBI

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.

Article

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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

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312 ajp.psychiatryonline.org Am J Psychiatry 167:3, March 2010

Symptoms of Major Depression

- Feeling sad or down > 2 weeks
- Loss of interest in pleasurable activities
- Change in sleep
- Change in eating
- Difficulty with concentration
- Feelings of hopelessness
- Loss of energy
- Thoughts of suicide

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Depression and TBI

- Frequency of Depressive Disorder – 6% to 77% Robinson and Jorge 2005
- 1 month s/p TBI (mostly moderate TBI sample)
  - 26% of patients developed major depression
  - 3% minor depression Jorge et al. 1993
- After 1 year – 25% rate of depression with some patients recovering and others developing delayed onset Jorge et al. 1993

20% - 40% of individuals affected at any point in time during the first year

About 50% of people experiencing depression at some stage Fleminger et al. 2003

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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).

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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).

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

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.

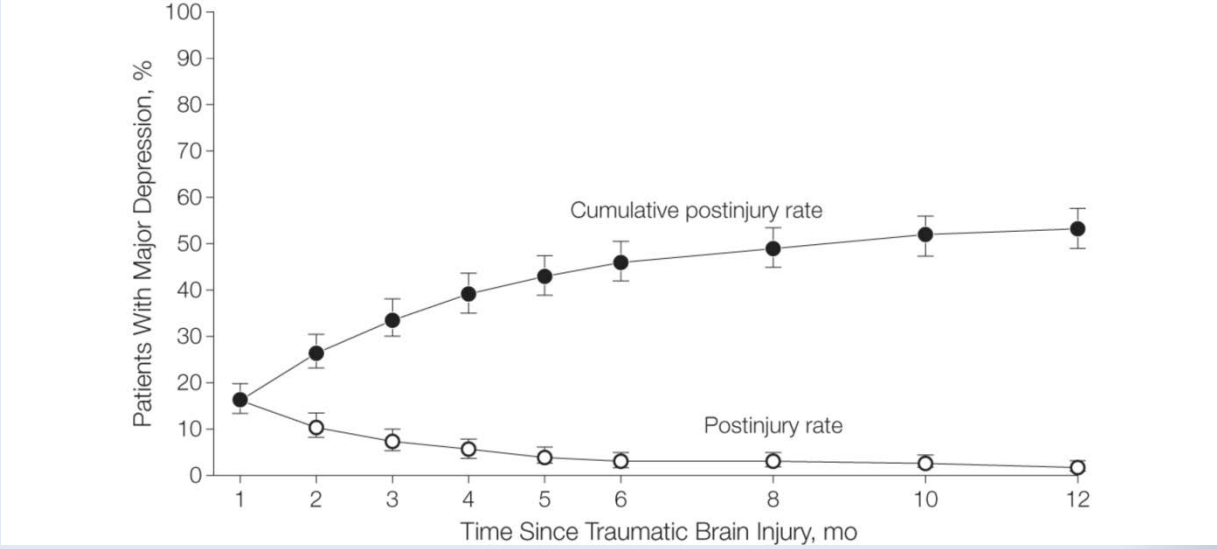

Figure Legend:

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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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.

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

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.

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.

Key Words: Brain injuries; Depression; Rehabilitation.

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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

Minor depression is dx when 2-4 sx of depression persist for at least 2 weeks

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

ORIGINAL ARTICLE

A Longitudinal Study of Major and Minor Depression Following Traumatic Brain Injury

Tessa Hart, PhD, Jeanne M. Hoffman, PhD, Christopher Pretz, PhD, Richard Kennedy, MD, PhD, Allison N. Clark, PhD, Lisa A. Brenner, PhD

ABSTRACT. Hart T, Hoffman JM, Pretz C, Kennedy R, Clark AN, Brenner LA. A longitudinal study of major and minor depression following traumatic brain injury. Arch Phys Med Rehabil 2012;93:1343-9.

Objective: To examine patterns of change and factors associated with change in depression, both major (major depressive disorder [MDD]) and minor, between 1 and 2 years after traumatic brain injury (TBI).

Design: Observational prospective longitudinal study.

Setting: Inpatient rehabilitation centers, with 1- and 2-year follow-up conducted primarily by telephone.

Participants: Persons with TBI (N=1089) enrolled in the Traumatic Brain Injury Model Systems database, followed at 1 and 2 years postinjury.

Interventions: Not applicable.

Measure: Patient Health Questionnaire-9.

Results: Among participants not depressed at 1 year, close to three fourths remained so at 2-year follow-up. However, 26% developed MDD or minor depression between the first and second years postinjury. Over half of participants with MDD at year 1 also reported MDD the following year, with another 22% reporting minor depression; thus three fourths of those with MDD at year 1 experienced clinically significant symptoms at year 2. Almost one third of those with minor depression at year 1 traversed to MDD at year 2. Polytomous logistic regression confirmed that worse depression at year 1 was associated with higher odds of depression a year later. For those without depression at year 1, symptom worsening over time was related to year 2 problematic substance use and lower FIM motor and cognitive scores. For those with depression at year 1, worsening was associated with lower cognitive FIM, poor social support, and preinjury mental health issues including substance abuse.

Predictors of change differ according to symptom onset. Results highlight importance of long-term monitoring for depression, treating minor as well as major depression, and developing interventions for comorbid depression and substance abuse.

Key Words: Brain injuries; Depression; Mental health; Rehabilitation.

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DEPRESSION IS THE most frequently diagnosed psychiatric disorder after traumatic brain injury (TBI).[1] Most studies have focused on major depressive disorder (MDD), defined as at least a 2-week duration of 5 or more symptoms listed in the *Diagnostic and Statistical Manual of Mental Disorders, edition IV* (DSM-IV),[2] including depressed mood or anhedonia. Nearly half of those with TBI experience MDD in the first year, even excluding those depressed at the time of injury.[3] Risk factors for post-TBI depression include younger age,[3,4] lower education,[4,5] being a woman,[6] and premorbid psychiatric problems,[6] including substance abuse.[3] Severity of brain injury, however, does not appear related to presence or severity of depression.[4,5,7,8]

Depression after TBI is associated with unfavorable outcomes including decreased social activity and unemployment,[9-12] reduced quality of life,[9,13] and suicide.[14] The causal relationships remain unclear, with some suggestion that depression follows participation restrictions more often than vice versa.[15] Fewer than half of those with TBI and MDD receive antidepressants or counseling.[3] To better implement treatments, and to prevent unfavorable outcomes, it is important to understand the trajectory and persistence of depressive symptoms after TBI.

There are few longitudinal studies of post-TBI depression and most have focused on the first year after injury. Pagulayan et al[15] found that the overall proportion of participants with depression decreased from 44% at 1 month to 29% at 1 year. However, some individuals improved, some deteriorated, and some were unchanged. Gould et al[16] found that rates of new psychiatric disorders, including depression, increased over the first year for participants with no prior history, and that typical risk factors (age, sex) did not predict who would be affected.

List of Abbreviations

CI	confidence interval
DSM-IV	*Diagnostic and Statistical Manual of Mental Disorders, edition IV*
GCS	Glasgow Coma Scale
MDD	major depressive disorder
MLR	multiple linear regression
PHQ-9	Patient Health Questionnaire-9
TBI	traumatic brain injury
TBIMS	Traumatic Brain Injury Model Systems

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

Alcohol/Drugs and TBI Acquisition

The greatest risk factors for traumatic brain injury:

Alcohol/drug use

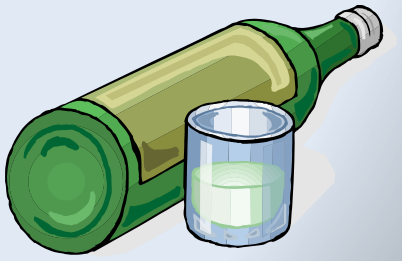
An alcohol/drug disorder

Miller and Adams 2005

Studies suggest that between 1/3 to slightly over 1/2 of persons with TBI are intoxicated at the time of injury and/or show a pre-injury history of alcohol abuse

Corrigan 1995

At least ¼ of individuals with TBI are moderate to heavy drinkers between 1 and 3 years post-injury



Kreutzer et al. 1996

Drug Use Post-TBI

	Before	After	Community Base Rate
Substance Use Disorders*	40%	28%	17%

*Includes alcohol/drug dependence or abuse, or both

Hibbard et al. 1998

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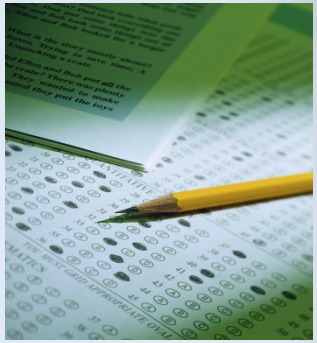
Patients with histories of substance abuse – worse outcomes after TBI



Corrigan 1995

TBI, Substance Abuse, and Psychiatric Hospitalization

Controlling for follow-up time, problematic drug and alcohol use was associated with an increased probability of psychiatric hospitalization, with an odds ratio (OR) of 7.8 (95% CI: 2.7, 23.1; p=0.0002).

Brenner et al., 2008

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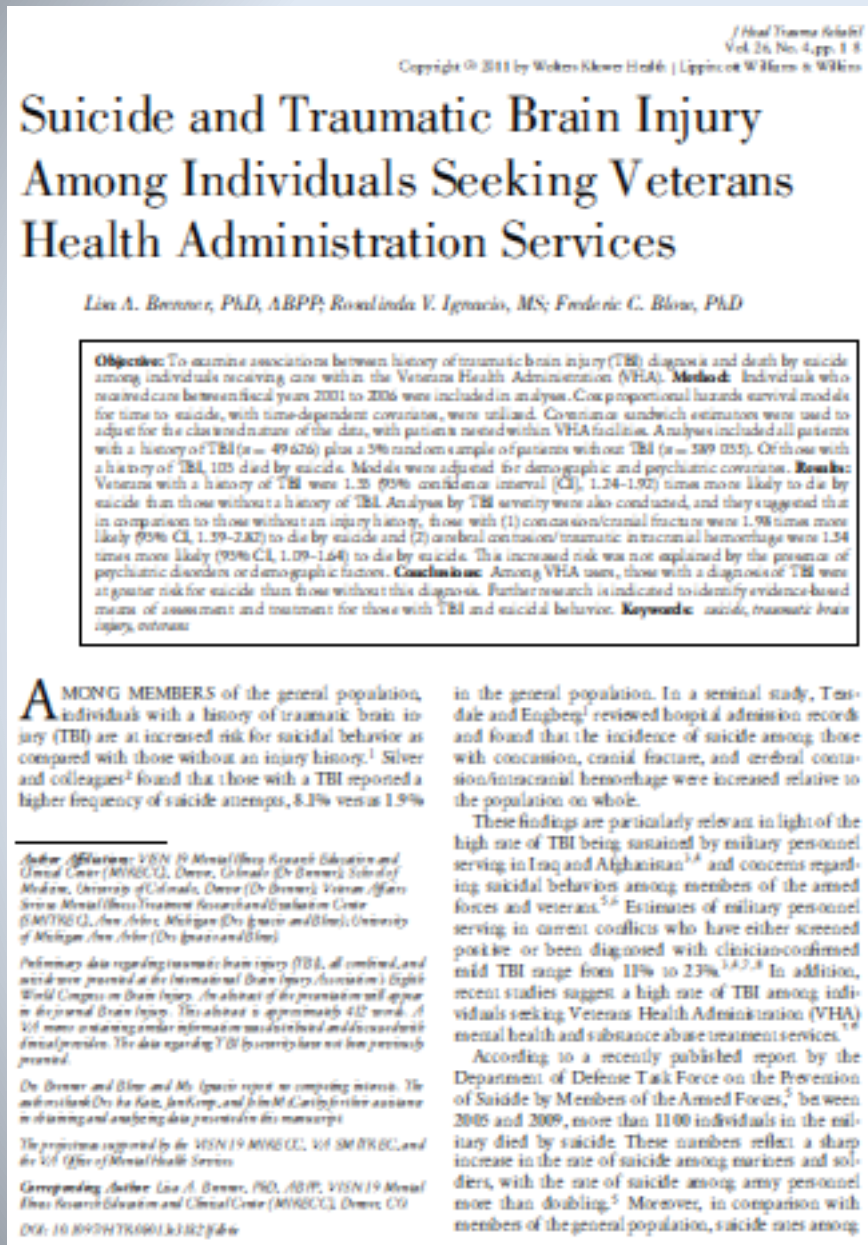

J Head Trauma Rehabil
Vol. 26, No. 4, pp. 1–8
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Suicide and Traumatic Brain Injury Among Individuals Seeking Veterans Health Administration Services

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, 103 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], 1.24–1.92) 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, 1.59–2.82) 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*

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 on 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.[7,8]

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 members of the general population, suicide rates among

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

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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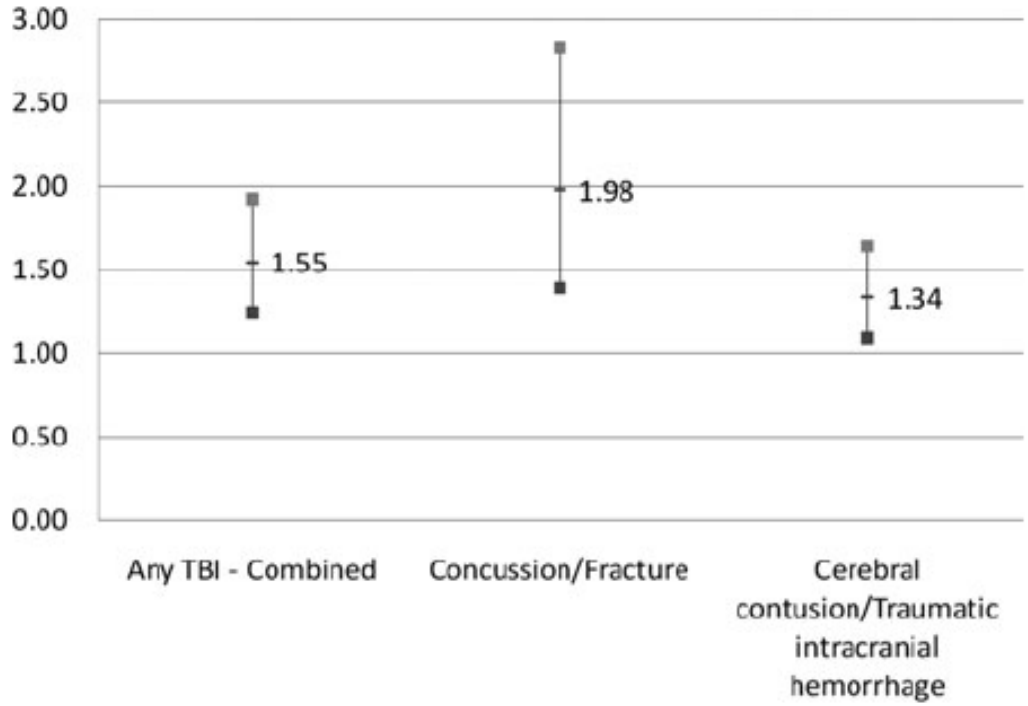

Figure 2. Hazard ratios for suicide by traumatic brain injury severity adjusted for sex, age, and psychiatric conditions.

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
Vol. 26, No. 4, pp. 257–264
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Lisa A. Brenner, PhD, ABPP; Rosalinda V. Ignacio, MS; Frederic C. Blow, PhD

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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.

The project was supported by the VISN 19 MIRECC, VA SMITREC, and the VA Office of Mental Health Services.

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DOI: 10.1097/HTR.0b013e31821fdb6e

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

Archives of Suicide Research, 12:336–343, 2008
Copyright © International Academy for Suicide Research
ISSN: 1381-1118 print/1543-6136 online
DOI: 10.1080/13811110802324961

Routledge
Taylor & Francis Group

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

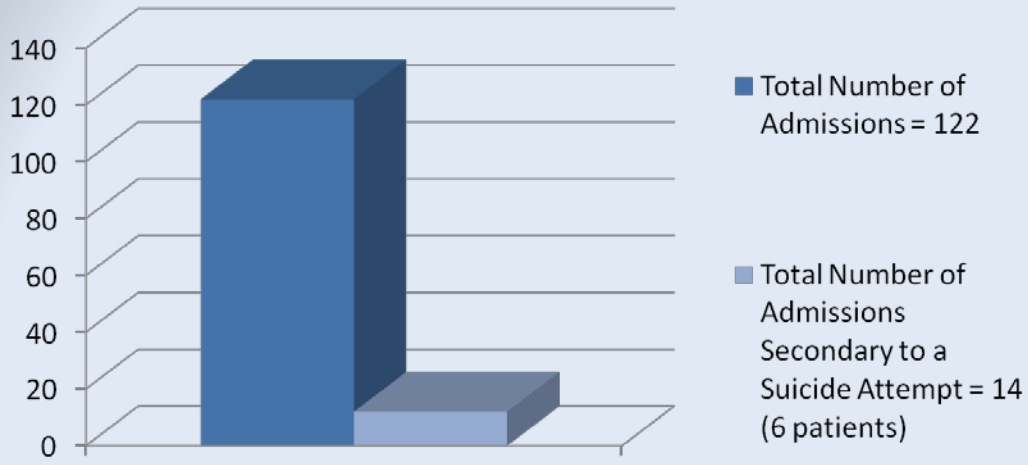
[1]Pedestrian hit by car, suicide attempt; MVA = motor vehicle accident, MCA = motorcycle accident.

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)

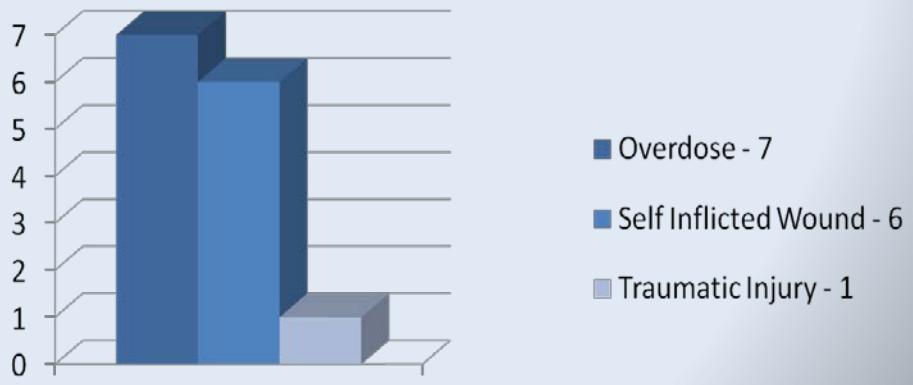
[1]Psychiatric diagnoses total to more than 100% due to the majority of patients receiving more than one diagnosis. [2]Includes dementia and mood disorders due to general medical condition. [3]Two patients were admitted and discharged on the same day.

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

Hopelessness After TBI

Psychological Medicine, 2002, **32**, 687–697. © 2002 Cambridge University Press
DOI: 10.1017/S0033291702005561 Printed in the United Kingdom

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

GRAHAME SIMPSON[1] AND ROBYN TATE

From the Brain Injury Rehabilitation Unit, Liverpool Hospital and Rehabilitation Studies Unit, Department of Medicine, University of Sydney and Royal Rehabilitation Centre, Sydney, NSW, Australia

- 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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Rehabilitation Psychology
2009, Vol. 54, No. 4, 396–397

In the public domain
DOI: 10.1037/a0017502

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

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Objective: 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) suggest an 8.1% lifetime rate 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 1990 (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 222,620) endorsed some suicidal ideation (Hoge, Auchterlonie, & Milliken, 2006). Moreover, 467 of the 222,620 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 (Peake, 2008). This number includes approximately 333,000 Veterans who served in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) (Peake, 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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The authors would like to thank P. Kuipers and A. Lancaster for their assistance.

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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 Risk Assessment

- Refers to the establishment of a
  - clinical judgment of risk in the near future
  - based on the weighing of a very large amount of available clinical detail

Jacobs 2003

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We assess risk to…

Identify modifiable and treatable risk factors [warning signs] that inform treatment

Simon 2001

Take care of our patients

We should also assess to…take care of ourselves

- Risk management is a reality of practice
- 15-68% of psychiatrists have experienced a patient suicide (Alexander 2000, Chemtob 1988)
- About 33% of trainees have a patient die by suicide
- Paradox of training - toughest patients often come earliest in our careers

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Is a common language necessary to facilitate suicide risk assessment?

Do we have a common language?

The Language of Self-Directed Violence

Identification of the Problem

- Suicidal ideation
- Death wish
- Suicidal threat
- Cry for help
- Self-mutilation
- Parasuicidal gesture
- Suicidal gesture
- Risk-taking behavior
- Self-harm
- Self-injury
- Suicide attempt
- Aborted suicide attempt
- Accidental death
- Unintentional suicide
- Successful attempt
- Completed suicide
- Life-threatening behavior
- Suicide-related behavior
- Suicide

The Language of Self-Directed Violence

A Solution to the Problem

Nomenclature (def.):

- a set of commonly understood
- widely acceptable
- comprehensive
- terms that define the basic clinical phenomena (of suicide and suicide-related behaviors)
- based on a logical set of necessary component elements that can be easily applied

Silverman et al 2006

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Nomenclature: **Essential Features**

- enhance clarity of communication
- have applicability across clinical settings
- be theory neutral
- be culturally neutral
- use mutually exclusive terms that encompass the spectrum of thoughts and actions

Peter Brueghel the Elder, 1563

Silverman et al 2006

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Self-Directed Violence Classification System in Collaboration with the CDC

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Type	Sub-Type	Definition	Modifiers	Terms
Thoughts	Non-Suicidal Self-Directed Violence Ideation	Self-reported thoughts regarding a person's desire to engage in self-inflicted potentially injurious behavior. There is no evidence of suicidal intent. For example, persons engage in Non-Suicidal Self-Directed Violence Ideation in order to attain some other end (e.g., to seek help, regulate negative mood, punish others, to receive attention).	N/A	•Non-Suicidal Self-Directed Violence Ideation
	Suicidal Ideation	Self-reported thoughts of engaging in suicide-related behavior. For example, intrusive thoughts of suicide without the wish to die would be classified as Suicidal Ideation, Without Intent.	•Suicidal Intent -Without -Undetermined -With	•Suicidal Ideation, Without Suicidal Intent •Suicidal Ideation, With Undetermined Suicidal Intent •Suicidal Ideation, With Suicidal Intent
Behaviors	Preparatory	Acts or preparation towards engaging in Self-Directed Violence, but before potential for injury has begun. This can include anything beyond a verbalization or thought, such as assembling a method (e.g., buying a gun, collecting pills) or preparing for one's death by suicide (e.g., writing a suicide note, giving things away). For example, hoarding medication for the purpose of overdosing would be classified as Suicidal Self-Directed Violence, Preparatory.	• Suicidal Intent -Without -Undetermined -With	•Non-Suicidal Self-Directed Violence, Preparatory •Undetermined Self-Directed Violence, Preparatory •Suicidal Self-Directed Violence, Preparatory
	Non-Suicidal Self-Directed Violence	Behavior that is self-directed and deliberately results in injury or the potential for injury to oneself. There is no evidence, whether implicit or explicit, of suicidal intent. For example, persons engage in Non-Suicidal Self-Directed Violence in order to attain some other end (e.g., to seek help, regulate negative mood, punish others, to receive attention).	• Injury -Without -With -Fatal • Interrupted by Self or Other	•Non-Suicidal Self-Directed Violence, Without Injury •Non-Suicidal Self-Directed Violence, Without Injury, Interrupted by Self or Other •Non-Suicidal Self-Directed Violence, With Injury •Non-Suicidal Self-Directed Violence, With Injury, Interrupted by Self or Other •Non-Suicidal Self-Directed Violence, Fatal
	Undetermined Self-Directed Violence	Behavior that is self-directed and deliberately results in injury or the potential for injury to oneself. Suicidal intent is unclear based upon the available evidence. For example, the person is unable to admit positively to the intent to die (e.g., unconsciousness, incapacitation, intoxication, acute psychosis, disorientation, or death); **OR** the person is reluctant to admit positively to the intent to die for other or unknown reasons.	• Injury -Without -With -Fatal • Interrupted by Self or Other	•Undetermined Self-Directed Violence, Without Injury •Undetermined Self-Directed Violence, Without Injury, Interrupted by Self or Other •Undetermined Self-Directed Violence, With Injury •Undetermined Self-Directed Violence, With Injury, Interrupted by Self or Other •Undetermined Self-Directed Violence, Fatal
	Suicidal Self-Directed Violence	Behavior that is self-directed and deliberately results in injury or the potential for injury to oneself. There is evidence, whether implicit or explicit, of suicidal intent. For example, a person with a wish to die cutting her wrist with a knife would be classified as Suicide Attempt, With Injury.	• Injury -Without -With -Fatal • Interrupted by Self or Other	•Suicide Attempt, Without Injury •Suicide Attempt, Without Injury, Interrupted by Self or Other •Suicide Attempt, With Injury •Suicide Attempt, With Injury, Interrupted by Self or Other •Suicide

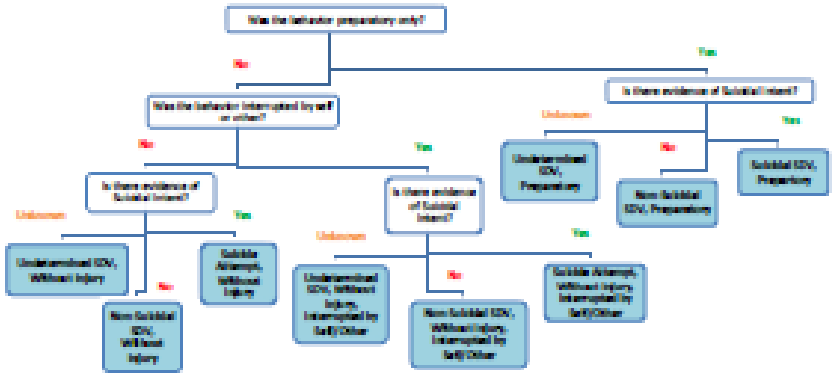
Self-Directed Violence (SDV) Classification System
Clinical Tool

BEGIN WITH THESE 3 QUESTIONS:

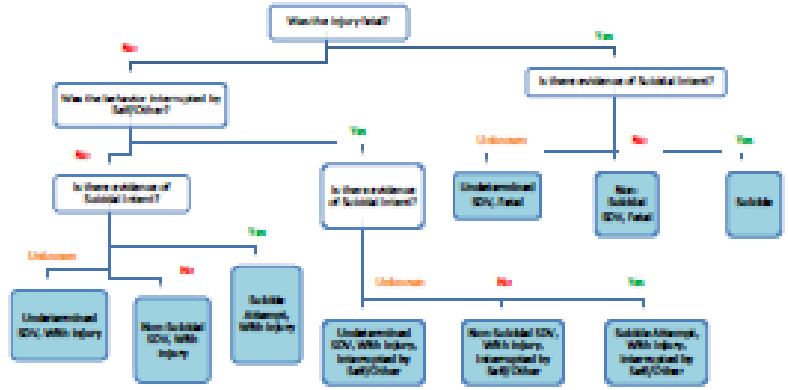
1. Is there any indication that the person engaged in self-directed violent behavior, either preparatory or potentially harmful? (Refer to Key Terms on reverse side)
   If NO, proceed to Question 2; If YES, proceed to Question 3
2. Is there any indication that the person had self-directed violence related thoughts?
   If NO to Questions 1 and 2, there is insufficient evidence to suggest self-directed violence → NO SDV TERM
   If YES, proceed to Decision Tree A
3. Did the behavior involve any injury?
   If NO, proceed to Decision Tree B
   If YES, proceed to Decision Tree C

DECISION TREE A: THOUGHTS

DECISION TREE B: BEHAVIORS, WITHOUT INJURY



DECISION TREE C: BEHAVIORS, WITH INJURY



Self-Directed Violence (SDV) Classification System
Clinical Tool

Key Terms (Centers for Disease Control and Prevention)

Self-Directed Violence:	Behavior that is self-directed and deliberately results in injury or the potential for injury to oneself.
Suicidal Intent:	There is past or present evidence (explicit and/or implicit) that the individual intended to kill him/herself and wished to die, and that he/she understood the probable consequences of his/her actions or potential actions.
Preparatory Behavior:	Acts or preparation towards imminently making a suicide attempt, but before potential for harm has begun. This can include anything beyond a verbalization or thought, such as assembling a method (e.g., buying a gun, collecting pills) or preparing for one's death by suicide (e.g., writing a suicide note, giving things away).
Physical Injury (paraphrased):	A bodily lesion resulting from acute overexposure to energy (this can be mechanical, thermal, electrical, chemical, or radiant) interacting with the body in amounts or rates that exceed the threshold of physiological tolerance (e.g., bodily harm due to suffocation, poisoning or overdoses, lacerations, gunshot wounds, etc.). Refer to the Classification System for the full CDC definition.
Interrupted By Self or Other	A person takes steps to injure self but is stopped by self/another person prior to fatal injury. The interruption may occur at any point.
Suicide Attempt:	A non-fatal self-inflicted potentially injurious behavior with any intent to die as a result of the behavior
Suicide:	Death caused by self-inflicted injurious behavior with any intent to die as a result of the behavior

Reminder: Behaviors Trump Thoughts

Suicidal Intent

There is past or present evidence (implicit or explicit) that an individual wishes to die, means to kill him/herself, and understands the probable consequences of his/her actions or potential actions. Suicidal intent can be determined retrospectively and in the absence of suicidal behavior.

Now that we are using a common language

How should we be assessing risk?

“Although self-report measures are often used as screening tools, an adequate evaluation of [suicidal thoughts and behaviors] should include both interviewer-administered and self-report measures.”

http://www.suicidology.org/c/document_library/get_file?folderId=235&name=DLFE-113.pdf

Elements of Useful Assessment Tools

- Clear operational definitions of construct assessed
- Focused on specific domains (suicidality?)
- Developed through systematic, multistage process
  - empirical support for item content, clear administration and scoring instructions, reliability, and validity
- Range of normative data available

Gutierrez and Osman, 2008

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Basic Considerations

- Context specific
  - schools, military, clinical settings
- Available resources
  - time, money, staffing
- Infrastructure to support outcomes
  - available referrals
  - trained clinical staff in-house

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Self-Report Measures

- Advantages
  - Fast and easy to administer
  - Patients often more comfortable disclosing sensitive information
  - Quantitative measures of risk/protective factors
- Disadvantages
  - Report bias
  - Face validity

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Evidence-Based Measures

- Suicidal Ideation - Beck Scale for Suicide Ideation
- Depressive Symptoms – Beck Depression Inventory II
- Hopelessness - Beck Hopelessness Scale
- Thoughts about the future - Suicide Cognitions Scale
- History of Suicide - Related Behaviors - Self-Harm Behavior Questionnaire
- Protective Factors - Reasons for Living Inventory

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"The purpose of this review is to provide a systematic examination of the psychometric properties of measures of suicidal ideation and behavior for younger and older adults."

A Review of Suicide Assessment Measures

for Intervention Research with Adults and Older Adults

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Acknowledgements: The author would like to thank Randy Fingerhut, Ph.D., Gregg R. Henriques, Ph.D., Hilary Himes, and Anna Tverskoy who assisted with the preparation of this manuscript. Editorial comments from Aaron T. Beck, M.D., Yeates Conwell, M.D., David Goldston, Ph.D., David A. Jobes, Ph.D., Marsha M. Linehan, Ph.D., Jane L. Pearson, Ph.D., Holly Prigerson, Ph.D., M. David Rudd, Ph.D., and Robert A. Steer, Ed.D. are greatly appreciated. The author is also grateful to the authors of the assessment measures in this review who provided assistance.

"Many of these measures have demonstrated adequate internal reliability and concurrent validity. …It is therefore a serious problem that the predictive validity for most suicide measures has not been established. In fact, only a few instruments, such as the Scale for Suicide Ideation and the Beck Hopelessness Scale, have been found to be significant risk factors for …
suicide."

http://www.suicidology.org/c/document_library/get_file?folderId=235&name=DLFE-113.pdf

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Evidence-Based Measures: Suicidality in Those With TBI:

1

RESEARCH NEEDED!!!

Journal of Personality Assessment, *92*(4), 349–355, 2010
Copyright © Taylor & Francis Group, LLC
ISSN: 0022-3891 print / 1532-7752 online
DOI: 10.1080/00223891.2010.482011

Routledge
Taylor & Francis Group

Predicting Suicidal Behavior in Veterans With Traumatic Brain Injury: The Utility of the Personality Assessment Inventory

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In this study, we investigated the Personality Assessment Inventory's (PAI; Morey, 1991, 2007) Suicide Potential Index (SPI) and Suicide Ideation scale (SUI) as predictors of suicidal behavior (SB) in military Veterans with traumatic brain injury (TBI; $N = 154$). We analyzed electronic medical records were searched for SB in the 2 years post-PAI administration and data via logistic regressions. We obtained statistical support for the SPI and SUI as predictors of SB. Analyses we performed using receiver operating characteristics suggested an optimal SPI cutoff of ≥ 15 for this sample. Findings suggest that SPI and SUI scores may assist in assessing suicide risk in those with TBI, particularly when population-based cutoffs are considered.

What are the key components?

Suicide focused clinical interview

Psychological/Psychiatric Evaluation

What is a Suicide Risk Factor?

- A major focus of research for past 30 years
- Factors
  - Demographic (e.g., male gender, age over 65, Caucasian)
  - Psychosocial (e.g., diagnosed serious mental illness, loss of significant relationship, impulsivity)
  - Past history (e.g., suicide attempt, sexual or physical abuse)

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Risk Factors

- Overall level of clinical concern about an individual
- Guide screening and assessment efforts
- Developing models to explain suicide
- Distal to suicidal behavior
- May or may not be modifiable
- Risk factors do not predict individual behavior

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Determine if Factors are Modifiable

Non-Modifiable Risk Factors

- Family History
- Past History
- Demographics

Modifiable Risk Factors

- Psychiatric symptoms
- Social Support
- Access to Lethal Means

Warning Signs

- Warning signs – person-specific emotions, thoughts, or behaviors precipitating suicidal behavior
  - Thoughts of suicide
  - Thoughts of death
  - Sudden changes in personality, behavior, eating or sleeping patterns
- Proximal to the suicidal behavior and imply imminent risk

Rudd et al. 2006

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Risk Factors vs. Warning Signs

Characteristic Feature	Risk Factor	Warning Sign
Relationship to Suicide	Distal	Proximal
Empirical Support	Evidence-base	Clinically derived
Timeframe	Enduring	Imminent
Nature of Occurrence	Relatively stable	Transient
Implications for Clinical Practice	At times limited	Demands intervention

Rudd et al. 2006

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Risk Factors vs. Warning Signs

Risk Factors

- Suicidal ideas/behaviors
- Psychiatric diagnoses
- Physical illness
- Childhood trauma
- Genetic/family effects
- Psychological features (i.e. psychosis, hopelessness)
- Cognitive features
- Demographic features
- Access to means
- Substance intoxication
- Poor therapeutic relationship

Warning Signs

- Threatening to hurt or kill self or talking of wanting to hurt or kill him/herself
- Seeking access to lethal means
- Talking or writing about death, dying or suicide
- Increased substance (alcohol or drug) use
- No reason for living; no sense of purpose in life
- Feeling trapped - like there's no way out
- Anxiety, agitation, unable to sleep
- Hopelessness
- Withdrawal, isolation

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Empirical test of warning signs almost non-existent

AMERICAN ASSOCIATION OF SUICIDOLOGY

- Warning Signs of Acute Risk:
  - Threatening to hurt or kill him or herself, or talking of wanting to hurt or kill him/herself; and/or,
  - Looking for ways to kill him/herself by seeking access to firearms, available pills, or other means; and/or,
  - Talking or writing about death, dying or suicide, when these actions are out of the ordinary.

http://www.suicidology.org/web/guest/stats-and-tools/warning-signs

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- Additional Warning Signs:
  - Increased **substance** (alcohol or drug) **use**
  - No reason for living; no sense of **purpose** in life
  - Rage, uncontrolled **anger**, seeking revenge
  - Acting **reckless** or engaging in risky activities, seemingly without thinking
  - Dramatic **mood changes**.
  - **Anxiety**, agitation, unable to sleep or sleeping all the time
  - Feeling **trapped** - like there's no way out
  - **Hopelessness**
  - **Withdrawal** from friends, family and society

http://www.suicidology.org/web/guest/stats-and-tools/warning-signs

VA Risk Assessment Pocket Card

RESPONDING TO SUICIDE RISK

ASSURE THE PATIENT'S IMMEDIATE SAFETY AND DETERMINE MOST APPROPRIATE TREATMENT SETTING

- Refer for mental health treatment or assure that follow-up appointment is made
- Inform and involve someone close to the patient
- Limit access to means of suicide
- Increase contact and make a commitment to help the patient through the crisis

PROVIDE NUMBER OF
ER/URGENT CARE CENTER
TO PATIENT AND SIGNIFICANT OTHER

National Suicide Hotline Resource:

1 – 800 – 273 - TALK (8255)

References:
American Psychiatric Association. Practice Guidelines for the Assessment and Treatment of Patients with Suicidal Behaviors, 2nd ed. In: Practice Guidelines for the Treatment of Psychiatric Disorders Compendium. Arlington VA 2004. (835-1027).
Rudd et.al, Warning signs for suicide: theory, research and clinical applications. Suicide and Life Threatening Behavior, 2006 June36 (3)255-62.

Employee Education System

SUICIDE RISK ASSESSMENT GUIDE

All patients who present with positive depression screens, history of mental health diagnosis or with any of the Warning Signs listed below should be further assessed for suicide risk.

LOOK for the warning signs.
ASSESS for risk and protective factors.
ASK the questions.

LOOK FOR THE WARNING SIGNS

- Threatening to hurt or kill self
- Looking for ways to kill self
- Seeking access to pills, weapons or other means
- Talking or writing about death, dying or suicide

Presence of any of the above warning signs requires immediate attention and referral. Consider hospitalization for safety until complete assessment may be made.

Additional Warning Signs

- *Hopelessness*
- *Rage, anger, seeking revenge*
- *Acting reckless or engaging in risky activities, seemingly without thinking*
- *Feeling trapped – like there's no way out*
- *Increasing alcohol or drug abuse*
- *Withdrawing from friends, family and society*
- *Anxiety, agitation, unable to sleep or sleeping all the time*
- *Dramatic changes in mood*
- *No reason for living, no sense of purpose in life*

For any of the above, refer for mental health treatment or follow-up appointment.

Department of Veterans Affairs

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ASSESS FOR SPECIFIC FACTORS THAT MAY INCREASE OR DECREASE RISK FOR SUICIDE

FACTORS THAT MAY **INCREASE** RISK

- Current ideation, intent, plan, access to means
- Previous suicide attempt or attempts
- Alcohol/Substance abuse
- Previous history of psychiatric diagnosis
- Impulsivity and poor self-control
- Hopelessness – presence, duration, severity
- Recent losses – physical, financial, personal
- Recent discharge from an inpatient unit
- Family history of suicide
- History of abuse (physical, sexual or emotional)
- Co-morbid health problems, especially a newly diagnosed problem or worsening symptoms
- Age, gender, race (elderly or young adult, unmarried, white, male, living alone)
- Same-sex sexual orientation

FACTORS THAT MAY **DECREASE** RISK

- Positive social support
- Spirituality
- Sense of responsibility to family
- Children in the home, pregnancy
- Life satisfaction
- Reality testing ability
- Positive coping skills
- Positive problem-solving skills
- Positive therapeutic relationship

ASK THE QUESTIONS

Are you feeling hopeless about the present/future?

If yes ask...

Have you had thoughts about taking your life?

If yes ask...

When did you have these thoughts and do you have a plan to take your life?

Have you ever had a suicide attempt?

???

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Intervention

Psychological treatment for anxiety in people with traumatic brain injury (Review)

Soo C, Tate R

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2007, Issue 3

http://www.thecochranelibrary.com

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3,038 References – 3 Studies

- Corresponding group comparisons were as follows.
  - CBT versus supportive counseling (SC) (Bryant 2003)
  - Interpersonal process recall (IPR) therapy versus controls with no feedback on interpersonal functioning (Helffenstein 1982)
  - CBT combined with neurorehabilitation (NR) versus no psychological intervention controls (Tiersky 2005)

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Total # of Subjects

60

Findings

- Cognitive behavioral therapy (CBT) techniques following TBI effective in comparison to supportive counseling (n=24) (Bryant 2003)
- Combining CBT and neurorehablitation for targeting general anxiety sx for mild to mod TBI (n=16) (Helffenstein 1982)
- Limited empirical support for Interpersonal process recall (n=20) (Helffenstein 1982)

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Report of (VA) Consensus Conference: Practice Recommendations for Treatment of Veterans with Comorbid TBI, Pain, and PTSD

National Center for PTSD
Posttraumatic Stress Disorder

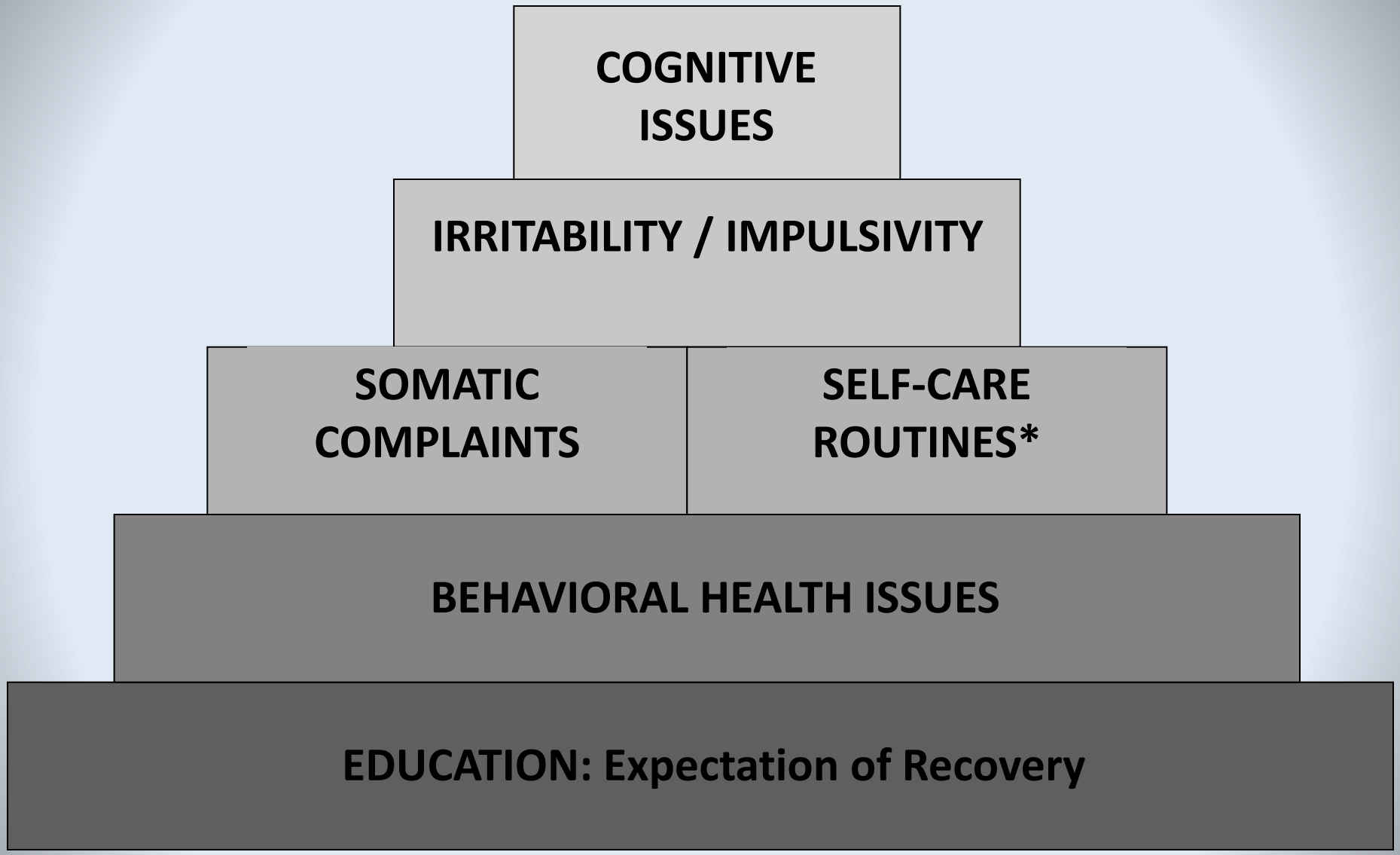
Executive Summary:

The Special Committee on PTSD in FY2008 recognized the dilemma of increasing numbers of Veterans presenting with PTSD and co-morbid Mild Traumatic Brain Injury (mTBI) faced by VA clinicians and recommended a consensus conference be planned and convened. The Undersecretary for Health concurred and in the VA response to the Committee's 2008 Report, charged the National Center for PTSD to develop a multidisciplinary workgroup to proceed with plans. The group was asked to propose treatment recommendations within the context of current programs and processes that could be rapidly disseminated to VA clinicians.

A conference planning committee was organized in October 2008, with membership from VA's

The new clinical practice guideline for concussion/mTBI focuses on promoting a recovery expectation, noting that a vast majority of patients will improve without lasting effects and that mTBI is a common injury with a time-limited, predictable course. It states that education of patients and families is the best available intervention for veterans starting treatment. For ongoing or chronic post-concussive symptoms, the guidelines take the clinician through each symptom profile step-by-step for recommended assessments and treatments.

TBI Step-Care Treatment Model†



† Begin each encounter at the bottom of the pyramid and progress upward

* Includes sleep hygiene, diet, exercise, and avoiding further TBI

Terrio 2009

"This systematic review documents that there is a paucity of RCTs for depression following TBI. Serotonergic antidepressants and CBT interventions appear to have the best **preliminary evidence…**"

JOURNAL OF NEUROTRAUMA 25:2383–2402 (December 2008)
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DOI: 10.1089/neu.2008.1091

Treatment for Depression after Traumatic Brain Injury: A Systematic Review

Jesse R. Fann,[1] Tessa Hart,[2] and Katherine G. Schomer[3]

Abstract

The aim of this systematic review was to critically evaluate the evidence on interventions for depression following traumatic brain injury (TBI) and provide recommendations for clinical practice and future research. We reviewed pharmacological, other biological, psychotherapeutic, and rehabilitation interventions for depression following TBI from the following data sources: PubMed, CINAHL, PsycINFO, ProQuest, Web of Science, and Google Scholar. We included studies written in English published since 1980 investigating depression and depressive symptomatology in adults with TBI; 658 articles were identified. After reviewing the abstracts, 57 articles met the inclusion criteria. In addition to studies describing interventions designed to treat depression, we included intervention studies in which depressive symptoms were reported as a secondary outcome. At the end of a full review in which two independent reviewers extracted data, 26 articles met the final criteria that included reporting data on participants with TBI, and using validated depression diagnostic or severity measures pre- and post-treatment. Three external reviewers also examined the study methods and evidence tables, adding 1 article, for a total of 27 studies. Evidence was classified based on American Academy of Neurology criteria. The largest pharmacological study enrolled 54 patients, and none of the psychotherapeutic/rehabilitation interventions prospectively targeted depression. This systematic review documents that there is a paucity of randomized controlled trials for depression following TBI. Serotonergic antidepressants and cognitive behavioral interventions appear to have the best preliminary evidence for treating depression following TBI. More research is needed to provide evidence-based treatment recommendations for depression following TBI.

Key words: depression; psychiatry; review; traumatic brain injury; treatment

Introduction

TRAUMATIC BRAIN INJURY (TBI) is a major cause of disability worldwide, particularly with declining mortality rates (Thurman and Guerrero, 1999). In the U.S., an estimated 1.4 million people sustain a TBI annually, and approximately 3.17 million Americans live with TBI-related disabilities (Zaloshnja et al., 2008). Rates are similar for other industrialized nations (Bruns and Hauser, 2003). Data aggregated from Europe and the U.K. suggest that 235 per 100,000 people sustain a TBI severe enough to warrant hospitalization each year (Tagliaferri et al., 2006). The societal cost of TBI, including direct medical costs and indirect costs, has been estimated at $60 billion in the year 2000 in the U.S. alone (Finkelstein et al., 2006). These statistics do not include the toll incurred in the conflicts in Iraq and Afghanistan, which by any count is expected to comprise large numbers of persons with TBI and post-traumatic stress disorder (Hoge et al., 2008; Tanielian and Jaycox, 2008).

Long-term disability from TBI has primarily been attributed to neurobehavioral factors (Kraus and McArthur, 1999; NIH consensus development panel, 1999; Rosenthal et al., 1998b), and frequently includes difficulty remaining employed, maintaining social relationships, and fulfilling many other social roles (Hibbard et al., 1998; Kreutzer et al., 2003; Sander et al., 1996). In addition to the cognitive sequelae that contribute to these limitations, debilitating psychiatric problems such as depression, anxiety, and alcohol abuse are

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ORIGINAL ARTICLE

A Randomized Controlled Trial of Sertraline for the Treatment of Depression in Persons With Traumatic Brain Injury

Teresa A. Ashman, PhD, Joshua B. Cantor, PhD, Wayne A. Gordon, PhD, Lisa Spielman, PhD, Steve Flanagan, MD, Annika Ginsberg, BA, Clara Engmann, BA, Matthew Egan, BS, Felicia Ambrose, MD, Brian Greenwald, MD

ABSTRACT. Ashman TA, Cantor JB, Gordon WA, Spielman L, Flanagan S, Ginsberg A, Engmann C, Egan M, Ambrose F, Greenwald B. A randomized controlled trial of sertraline for the treatment of depression in persons with traumatic brain injury. Arch Phys Med Rehabil 2009;90:733-40.

Objective: To examine the efficacy of sertraline in the treatment of depression after traumatic brain injury (TBI).

Design: Double-blind, randomized controlled trial.

Setting: Research center at a major urban medical center.

Participants: Subjects were a referred and volunteer sample of 52 participants with TBI, a diagnosis of major depression disorder (MDD), and a score on the Hamilton Rating Scale for Depression (HAM-D) of 18 or greater. The majority of the sample was male (58%), had less than 14 years of education (73%), had incomes below $20,000 (82%), and were from minority backgrounds (75%). Approximately one third of the sample had mild brain injuries, and two thirds had moderate to severe brain injuries. The mean age was 47±11, and the mean time since injury was 17±14 years. One participant withdrew from the study because of side effects.

Intervention: Daily oral sertraline in doses starting at 25mg and increasing to therapeutic levels (up to 200mg) or placebo for 10 weeks.

Main Outcome Measures: The HAM-D, the Beck Anxiety Inventory, and the Life-3 quality of life (QOL).

Results: No statistically significant differences were found at baseline between drug and placebo groups on baseline measures of depression (24.8±7.3 vs 27.7±7.0), anxiety (16.4±12.3 vs 24.0±14.9), or QOL (2.96±1.0 vs 2.9±0.9). The income level of those receiving placebo was significantly lower than those participants receiving medication. Analyses of covariance revealed significant changes from preintervention to postiretment for all 3 outcome measures ($P<.001$) but no group effects. Random-effects modeling did not find any significant difference in patterns of scores of the outcome measures between the placebo and medication groups.

Conclusions: Both groups showed improvements in mood, anxiety, and QOL, with 59% of the experimental group and 32% of the placebo group responding to the treatment, defined as a reduction of a person's HAM-D score by 50%.

Key Words: Anxiety; Brain injuries; Depression; Minority groups; Randomized controlled trials [publication type]; Rehabilitation; Sertraline.

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DEPRESSION AFTER TBI is well documented in the literature. The frequency of depressive disorders has been reported to range between 16% and 60%,[1-19] and MDD is the most commonly reported mood disorder after TBI, ranging from 24% to 35%.[1,2,14,15] The frequency of MDD is particularly noteworthy when contrasted with base rates of 6% to 7% in community-based samples.[16,17] Although some persons who experience post-TBI depression have a history of MDD or other depressive disorders before their TBI, the frequency of depression after TBI far exceeds premorbid rates.[3,8,9]

The large variation in rates of post-TBI depression reported in the literature can be attributed to inconsistencies in diagnostic and/or sampling methods used to categorize a person as depressed. Although the majority of studies since the mid-1990s have used more rigorous diagnostic criteria as defined by the DSM-IV,[18] there continue to be significant methodologic differences between studies investigating prevalence (eg, whether the sample assesses only a current diagnosis of depression or includes lifetime rates of depression, both before and after injury). Even when confining the literature review to studies that diagnose MDD based on DSM-IV criteria determined through clinical interview, the research[1,2,14,15] indicates that depression rates after TBI are extremely high (24%–35%). This research[1,4-7,9-11,14,15,19-23] has reported that persons can experience an MDD at any time after the TBI, ranging from 1 month to 30 years postinjury.

From the Department of Rehabilitation Medicine, Mount Sinai School of Medicine (Ashman, Cantor, Gordon, Engmann, Egan, Ambrose, Greenwald); New York University Rusk Institute of Rehabilitation Medicine (Flanagan), New York, NY; Private Consultant, Congers, NY (Spielman); and the Cancer Institute, New York University School of Medicine, New York, NY (Ginsberg).

Supported by the National Institute of Disability and Rehabilitation Research, United States Department of Education (grant no. H133A020501), and Pfizer Pharmaceutical Company (ClinicalTrials.gov Identifier: NCT00233103).

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.

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0003-9993/09/9005-0082$36.00/0
doi:10.1016/j.apmr.2008.11.005

List of Abbreviations

BAI	Beck Anxiety Inventory
DSM-IV	*Diagnostic and Statistical Manual of Mental Disorders-IV*
HAM-D	Hamilton Rating Scale for Depression
MDD	major depressive disorder
NS	not significant
QOL	quality of life
SCID	Structured Clinical Interview for DSM-IV Axis I Disorders
TBI	traumatic brain injury

Intervention: Daily oral sertraline in doses starting at 25mg and increasing to therapeutic levels (up to 200mg) or placebo for 10 weeks.

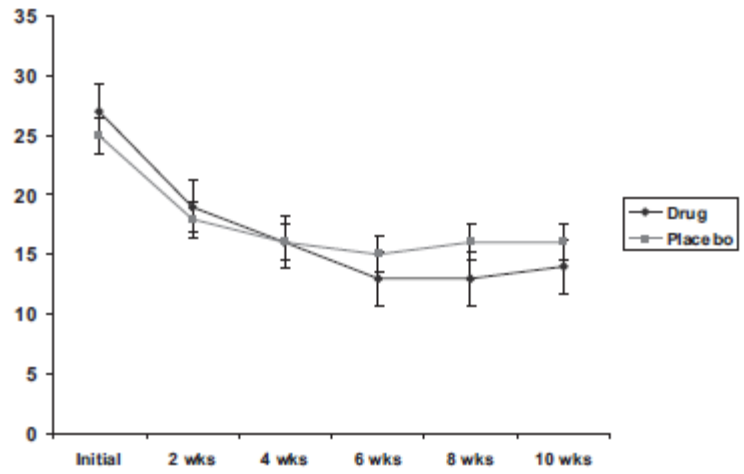

Fig 1. HAM-D scores over time.

7 scheduled follow-up phone sessions over 9 months to elicit concerns, provide information, and facilitate problem solving.

Brief Symptom Inventory Depression – higher scores = more severe symptoms

J Head Trauma Rehabil
Vol. 24, No. 4, pp. 230–238
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The Efficacy of a Scheduled Telephone Intervention for Ameliorating Depressive Symptoms During the First Year After Traumatic Brain Injury

Charles H. Bombardier, PhD; Kathleen R. Bell, MD; Nancy R. Temkin, PhD; Jesse R. Fann, MD, MPH; Jeanne Hoffman, PhD; Sureyya Dikmen, PhD

Objective: To determine whether an intervention designed to improve functioning after traumatic brain injury (TBI) also ameliorates depressive symptoms. **Design:** Single-blinded, randomized controlled trial comparing a scheduled telephone intervention to usual care. **Participants:** One hundred seventy-one persons with TBI discharged from an inpatient rehabilitation unit. **Methods:** The treatment group received up to 7 scheduled telephone sessions over 9 months designed to elicit current concerns, provide information, and facilitate problem solving in domains relevant to TBI recovery. **Outcome Measures:** Brief Symptom Inventory-Depression (BSI-D) subscale, Neurobehavioral Functioning Inventory-Depression subscale, and Mental Health Index-5 from the Short-Form-36 Health Survey. **Results:** Baseline BSI-D subscale and outcome data were available on 126 (74%) participants. Randomization was effective except for greater severity of depressive symptoms in the usual care (control) group at baseline. Outcome analyses were adjusted for these differences. Overall, control participants developed greater depressive symptom severity from baseline to 1 year than did the treatment group. The treated group reported significantly lower depression symptom severity on all outcome measures. For those more depressed at baseline, the treated group demonstrated greater improvement in symptoms than did the controls. **Conclusions:** Telephone-based interventions using problem-solving and behavioral activation approaches may be effective in ameliorating depressive symptoms following TBI. Proactive telephone calls, motivational interviewing, and including significant others in the intervention may have contributed to its effectiveness. **Keywords:** *depression, motivational interviewing, problem solving, telephone intervention*

DEPRESSION is arguably the most prevalent and disabling psychiatric condition associated with traumatic brain injury (TBI). Within the first few months after TBI, 15.6% to 26.5% of unselected patients meet criteria for major depressive disorder (MDD).[1,2] The observed period prevalence of MDD within the first year is 33% to 42%[3,4] and within the first 7 years is 61%.[5] A history of TBI confers an increased risk of MDD for up to 50 years after injury.[6]

The presence and severity of depression after TBI is associated with adverse outcomes including poorer cognitive functioning,[7] increased aggressive behavior and anxiety,[4,8] greater functional disability,[8–10] poorer global recovery,[2,11] and more postconcussive symptoms.[7,9] People with TBI and depression have poorer social functioning during the first year after injury.[4,12] In addition, TBI is associated with significantly higher rates of suicidal plans,[13] 8 times more attempts,[14] and 3 to 4 times more completed suicides than in the general population and non–brain-injured controls.[15]

Despite the prevalence and negative impact of depression among people with TBI, there is a striking paucity of research on the clinical effectiveness of any form of treatment for depression in this population. The limited data on pharmacotherapy for MDD after TBI tend to show that tricyclic antidepressants are not as effective as expected for post-TBI depression,[16,17] while selective serotonin reuptake inhibitors such as sertraline or citalopram[18–20] may have more promise. Data on the efficacy of psychological treatments for depression after TBI are virtually nonexistent.

Of these, 64 (74%) had a baseline assessment of depression symptoms and had completed at least 1 depressive symptom outcome measure at the 1-year assessment for the standard outpatient care group and 62 (73%) for the telephone intervention group (Fig 1). These 126 participants form the sample for this study.

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Charles H. Bombardier, PhD; Kathleen R. Bell, MD; Nancy R. Temkin, PhD; Jesse R. Fann, MD, MPH; Jeanne Hoffman, PhD; Sureyya Dikmen, PhD

TABLE 2 *Outcomes for full samples*

Variable	*n*	Control	*n*	Telephone	*P* value	*P* value (adjusted[a])
Full Sample	64		62			
Pre-post change in BSI-D (raw)	64	0.45 ± 0.95	57	0.08 ± 0.72	.019	...
Pre-post change in BSI-D (*T* score)	64	4.42 ± 10.75	57	1.32 ± 13.45	.161	...
Posttreatment BSI-D (raw)	64	1.03 ± 1.05	57	0.44 ± 0.66	.000	.003
Posttreatment BSI-D (*T* score)	64	60.4 ± 13.0	57	53.2 ± 11.5	.002	.017
Posttreatment NFI-D (SS)	57	32.2 ± 12.9	57	24.0 ± 9.1	.000	.002
Posttreatment MHI-5	63	20.2 ± 5.9	59	23.4 ± 4.8	.002	.009

Abbreviations: BSI-D, Brief Symptom Inventory-Depression; NFI-D, Neurobehavioral Functioning Inventory-Depression; SS, Subscale Score.
[a]After adjusting for baseline BSI-D.

Mild TBI (13–15)		13 (21 %)		15 (24 %)	
Baseline BSI-D (raw)	64	0.58 ± 0.66	62	0.35 ± 0.52	.030
Baseline BSI-D (*T* score)	64	56.0 ± 10.1	62	51.6 ± 10.1	.019

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Charles H. Bombardier, PhD; Kathleen R. Bell, MD; Nancy R. Temkin, PhD; Jesse R. Fann, MD, MPH; Jeanne Hoffman, PhD; Sureyya Dikmen, PhD

TABLE 3 *Outcomes for the subgroups depressed at baseline*

Variable	*n*	Control	*n*	Telephone	*P* value	*P* value (adjusted[a])
Full sample	23		14			
Baseline BSI-D (raw)	23	1.16 ± 0.74	14	1.08 ± 0.59	.746	...
Baseline BSI-D (*T* score)	23	66.6 ± 6.3	14	66.9 ± 6.8	.911	...
Posttreatment BSI-D (raw)	23	1.88 ± 1.09	14	0.62 ± 0.91	.001	.001
Posttreatment BSI-D (*T* score)	23	71.2 ± 9.4	14	55.8 ± 12.7	.000	.000
Pre-post change in BSI-D (raw)	23	0.72 ± 1.26	14	−0.46 ± 0.84	.004	...
Pre-post change in BSI-D (*T* score)	23	4.57 ± 10.21	14	−11.07 ± 11.44	.000	...
Posttreatment NFI-D (SS)	20	40.3 ± 14.1	12	27.1 ± 10.1	.008	.009
Posttreatment MHI-5	22	17.1 ± 6.3	14	21.9 ± 6.2	.030	.035

Abbreviations: BSI-D, Brief Symptom Inventory-Depression; MHI, Mental Health Index; NFI-D, Neurobehavioral Functioning Inventory-Depression.
[a]After adjusting for baseline BSI-D.

T score of 60 on BSI-D

A Randomized Controlled Trial of Exercise to Improve Mood After Traumatic Brain Injury

Jeanne M. Hoffman, PhD, Kathleen R. Bell, MD, Janet M. Powell, PhD, James Behr, MD, Erin C. Dunn, PhD, Sureyya Dikmen, PhD, Charles H. Bombardier, PhD

Objective: To test the hypothesis that a structured aerobic exercise regimen would decrease the severity of depressive symptoms in people with traumatic brain injury (TBI) who reported at least mild depression severity at baseline.
Design: Prospective, randomized, controlled trial.
Setting: Community gymnasium.
Participants: Subjects with a history of a prior TBI (6 months to 5 years post-injury), recruited from the community. Inclusion criteria included scoring ≥5 on the Patient Health Questionnaire-9. Subjects were excluded if they were non-English speakers, had a medical condition precluding exercise, had suicidal ideation, regularly exercised, or could not use standard aerobic exercise equipment.
Intervention: Weekly supervised exercise sessions over a 10-week period consisted of education, warm-up, 30 minutes of aerobic exercise, and cool down. The exercise intensity was adjusted to reach a heart rate goal of 60% of the participant's estimated maximal heart rate.
Main Outcome Measurement: Beck Depression Inventory (BDI) comparing exercise to control groups. Post hoc analyses compared groups exercising ≥90 minutes or <90 minutes per week.
Results: Between-group comparisons at 10 weeks revealed no difference between groups on the BDI ($P = .250$). For the groups divided by minutes exercised per week, the high-activity group had significantly better depression scores than those in the low-activity group ($P = .033$).
Conclusions: Although there was no statistically significant difference between the treated and the control group on mood after intervention, those persons with TBI who recounted higher levels of exercise per week also reported less depression and improved sleep, community participation, and overall quality of life.

PM R 2010;2:911-919

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Disclosure Key can be found on the Table of Contents and at www.pmrjournal.org

Submitted for publication March 5, 2010;

INTRODUCTION

Traumatic brain injury (TBI) is a major cause of disability in the United States and represents a serious public health issue with almost 1.5 million people sustaining nonfatal injuries each year [1, 2]. This figure may underestimate the true incidence because many cases of mild TBI are never directed to hospitals or even evaluated in emergency departments. Emotional distress and depression commonly occur after a brain injury [3]. Estimates of the rate of depression after TBI vary substantially ranging from 6% to 77% [4-6]. In a recent rigorous study of depression after TBI, Bombardier and colleagues [7] examined mood disorders in 559 TBI patients admitted to a trauma hospital. Subjects were assessed monthly for 6 months, then at 8, 10, and 12 months after TBI. Fifty-three percent of the sample met Diagnostic and Statistical Manual of Mental Disorders (4th edition) criteria for major depression at some point during the first year after TBI. Depression is not a transient phenomenon for those with TBI. The risk for depression remains elevated for decades after the TBI [8, 9]. Mild TBI is associated with depression at comparably high levels to more severe TBI [10].

PM&R
1934-1482/10/10A.00
Printed in U.S.A.

Results: Between-group comparisons at 10 weeks revealed no difference between groups on the BDI ($P = .250$). For the groups divided by minutes exercised per week, the high-activity group had significantly better depression scores than those in the low-activity group ($P = .033$).

CLINICAL UPDATE

Preventing suicide after traumatic brain injury: implications for general practice

Grahame K Simpson and Robyn L Tate

2 Suicide prevention strategies for general practitioners managing patients with traumatic brain injury (TBI)*

Level of intervention	Clinical management
Universal	
All people with TBI	• Assess hopelessness and suicide ideation proactively, using indirect or direct approaches • Monitor for warning signs that may increase risk level • Recognise that people may be at risk regardless of time post-injury • Make provision for the availability of long-term support • Monitor males and females equally
Selected	
People with TBI in "at-risk" groups	• Treat people with depressive or substance misuse conditions • Monitor people with comorbid psychiatric conditions and those injured as the result of a suicide attempt
Indicated	
People with TBI for whom suicide is an identified issue (eg, made attempt, expressed suicide ideation)	• Reduce the lethality of the environment • Provide frontline treatments (pharmacotherapy) • In managing someone with a history of any attempts, plan for the possibility that people may use more than one method • Provide support/monitor for at least 12 months after a suicide attempt • Closely monitor in the months after discharge from a psychiatric hospital

* Adapted from the United States Institute of Medicine generic suicide prevention model.[21]

Safety Planning and Suicide Prevention – A Function-Based Intervention

http://vaww.mentalhealth.va.gov/files/suicideprevention/VA_Safety_planning_manual_8-19-08revisions.doc

Final Version 8-20-08

Safety Plan Treatment Manual to Reduce Suicide Risk:

Veteran Version

Barbara Stanley, Ph.D.[1]
and
Gregory K. Brown, Ph.D.[2]

In collaboration with Bradley Karlin, Ph.D.[3], Janet E. Kemp, Ph.D.[4]
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VA Safety Plan: Brief Instructions*

Step 1: Recognizing Warning Signs

__ Ask "*How will you know when the safety plan should be used?*"
__ Ask, "*What do you experience when you start to think about suicide or feel extremely distressed?*"
__ List warning signs (thoughts, images, thinking processes, mood, and/or behaviors) using the patients' own words.

Step 2: Using Internal Coping Strategies

__ Ask *"What can you do, on your own, if you become suicidal again, to help yourself not to act on your thoughts or urges?"*
__ Ask *"How likely do you think you would be able to do this step during a time of crisis?"*
__ If doubt about using coping strategies is expressed, ask "What might stand in the way of you thinking of these activities or doing them if you think of them?"
__ Use a collaborative, problem solving approach to ensure that potential roadblocks are addressed and/or that alternative coping strategies are identified.

Step 3: Social Contacts Who May Distract from the Crisis

__ Instruct patients to use Step 3 if Step 2 does not resolve the crisis or lower risk.
__ Ask *"Who or what social settings help you take your mind off your problems at least for a little while? "Who helps you feel better when you socialize with them?"*
__ Ask patients to list several people and social settings, in case the first option is unavailable.
__ Ask for safe places they can go to do be around people, e.g. coffee shop.
__ Remember, in this step, suicidal thoughts and feelings are not revealed.

Step 4: Contacting Family Members or Friends Who May Offer Help to Resolve a Crisis

__ Instruct patients to use Step 4 if Step 3 does not resolve the crisis or lower risk.
__ Ask *"Among your family or friends, who do you think you could contact for help during a crisis?"* or *"Who is supportive of you and who do you feel that you can talk with when you're under stress?"*
__ Ask patients to list several people, in case they cannot reach the first person on the list. Prioritize the list. In this step, unlike the previous step, patients reveal they are in crisis.
__ Ask *"How likely would you be willing to contact these individuals?"*
__ If doubt is expressed about contacting individuals, identify potential obstacles and problem solve ways to overcome them.

Step 5: Contacting Professionals and Agencies

__ Instruct patients to use Step 5 if Step 4 does not resolve the crisis or lower risk.
__ Ask *"Who are the mental health professionals that we should identify to be on your safety plan?"* and *"Are there other health care providers?"*
__ List names, numbers and/or locations of clinicians, local urgent care services, VA Suicide Prevention Coordinator, VA Suicide Prevention Hotline (1-800-273-TALK (8255))
__ If doubt is expressed about contacting individuals, identify potential obstacles and problem solve ways to overcome them.

Step 6: Reducing the Potential for Use of Lethal Means

__ The clinician should ask patients which means they would consider using during a suicidal crisis and collaboratively identify ways to secure or limit access to these means.
__ For methods with low lethality, clinicians may ask veterans to remove or restrict their access to these methods themselves.
__ Restricting the veterans' access to a highly lethal method should be done by a designated, responsible person—usually a family member or close friend, or the police.

Major Challenges

1. How can a patient manage a suicidal crisis in the moment that it happens?
2. How can a clinician help the patient to do this?

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Suicide Risk Assessment

Mental Health Referral / Treatment

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Problems with This Approach

- Individuals often do not have a way to manage their crises
- Many of these individuals may not engage in follow-up treatment

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No Suicide Contracts

- No-suicide contracts ask patients to promise to stay alive without telling them how to stay alive

- No-suicide contracts may provide a false sense of assurance to the clinician

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Suicide Risk Assessment

Safety Plan

Mental Health Referral / Treatment

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What is a Safety Plan?

- Prioritized written list of coping strategies and resources for use during a suicidal crisis
- Helps provide a sense of control
- Uses a brief, easy-to-read format that uses the patients' own words
- Involves a commitment to treatment process (and staying alive)

Who Develops the Plan?

- Collaboratively developed by the clinician and the patient in any clinical setting
- Those who have
  - made a suicide attempt
  - have suicide ideation
  - have psychiatric disorders that increase suicide risk
  - otherwise been determined to be at high risk for suicide

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When Is It Appropriate?

- A safety plan may be done at any point during the assessment or treatment process
- Usually follows a suicide risk assessment
- Safety Plan may not be appropriate when patients are at imminent suicide risk or have profound
- The clinician should adapt the approach to the individual's needs -- such as involving family members in using the safety plan

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How Do You Do It?

- Clinician and patient should sit side-by-side, use a problem solving approach, and focus on developing the safety plan
- Safety plan should be completed using a form with the patient

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Step 1: Recognizing Warning Signs

- Safety plan is only useful if the patient can recognize the warning signs
- The clinician should obtain an accurate account of the events that transpired before, during, and after the most recent suicidal crisis
- Ask “How will you know when the safety plan should be used?”

Step 1: Recognizing Warning Signs

- Ask, “What do you experience when you start to think about suicide or feel extremely distressed?”
- Write down the warning signs (thoughts, images, thinking processes, mood, and/or behaviors) using the patients’ own words

Step 1: Recognizing Warning Signs Examples

- Automatic Thoughts
  - “I am a nobody”
  - “I am a failure”
  - “I don’t make a difference”
  - “I am worthless”
  - “I can’t cope with my problems”
  - “Things aren’t going to get better”
- Images
  - “Flashbacks”

Written Responses

	Step 1: Warning Signs
1.	*Needing to be alone*
2.	*Having a few too many drinks*
3.	*Feeling kinda numb*

Step 2: Using Internal Coping Strategies

- List activities that patients can do without contacting another person
- Activities function as a way to help patients take their minds off their problems and promote meaning in the patient's life
- Coping strategies prevent suicide ideation from escalating

Step 2: Using Internal Coping Strategies

- It is useful to have patients try to cope on their own with their suicidal feelings, even if it is just for a brief time
- Ask "What can you do, on your own, if you become suicidal again, to help yourself not to act on your thoughts or urges?"

Step 2: Using Internal Coping Strategies

- Examples:
  - Going for a walk
  - Listening to inspirational music
  - Taking a hot shower
  - Walking the dog

Step 2: Using Internal Coping Strategies

- Ask “How likely do you think you would be able to do this step during a time of crisis?”
- Ask “What might stand in the way of you thinking of these activities or doing them if you think of them?”
- Use a collaborative, problem solving approach to address potential roadblocks

Written Responses

	Step 2: Internal Coping Strategies
1.	*Go lift at the gym*
2.	*Watch sports*
3.	*Play drums*
4.	*Go for a walk*

Step 3: Socializing with Family Members or Others

- Coach patients to use Step 3 if Step 2 does not resolve the crisis or lower risk
- Family, friends, or acquaintances who may offer support and distraction from the crisis

Step 3: Socializing with Family Members or Others

- Ask “Who do you enjoy socializing with?”
- Ask “Who helps you take your mind off your problems at least for a little while?”
- Ask patients to list several people, in case they cannot reach the first person on the list

Written Responses

	Step 3: Socializing with family members or others
1.	*Go to the coffee shop*
2.	*Call my uncle 714-555-3868*
3.	*Go to the grocery store*

Step 4: Contacting Family Members or Friends for Help

- Coach patients to use Step 4 if Step 3 does not resolve the crisis or lower risk
- Ask “How likely would you be willing to contact these individuals?”
- Identify potential obstacles and problem solve ways to overcome them

Written Responses

	Step 4: Contacting family members or friends for help
1.	*Call my mom 555-4321*
2.	*Call my uncle 714-555-3868*

Step 5: Contacting Professionals and Agencies

- Coach patients to use Step 5 if Step 4 does not resolve the crisis or lower risk
- Ask “Which clinicians should be on your safety plan?”
- Identify potential obstacles and develop ways to overcome them

Step 5: Contacting Professionals and Agencies

- List names, numbers and/or locations of:
  - Clinicians
  - Local urgent care services
  - Crisis Prevention Hotline
    - 1-800-273-TALK (8255), press “1” if veteran

Written Responses

	Step 5: Contacting Professionals and Agencies
1.	*Call Dr. Bills 555-3434*
2.	*Go to Local VA Urgent Care*
3.	*1-800-273-TALK (8255) push 1*

Step 6: Reducing the Potential for Use of Lethal Means

- Ask patients what means they would consider using during a suicidal crisis
- Regardless, the clinician should always ask whether the individual has access to a firearm

Step 6: Reducing the Potential for Use of Lethal Means

- For methods with low lethality, clinicians may ask veterans to remove or restrict their access to these methods themselves
  - For example, if patients are considering overdosing, discuss throwing out any unnecessary medication

Step 6: Reducing the Potential for Use of Lethal Means

- For methods with high lethality, collaboratively identify ways for a responsible person to secure or limit access
  - For example, if patients are considering shooting themselves, suggest that they ask a trusted family member to store the gun in a secure place

Written Responses

	Step 6: Reducing the Potential for use of Lethal Means
1.	*Ask wife to give the gun to her brother until her father can get it*

Implementation: What is the Likelihood of Use?

1. Ask: “Where will you keep your safety plan?”
2. Ask: “How likely is it that you will use the Safety Plan when you notice the warning signs that we have discussed?”

Implementation: What is the Likelihood of Use?

3. Ask: “What might get in the way or serve as a barrier to your using the safety plan?”
   - Help the patient find ways to overcome these barriers
   - May be adapted for brief crisis cards, cell phones or other portable electronic devices – must be readily accessible and easy-to-use

Implementation: Review the Safety Plan Periodically

- Periodically review, discuss, and possibly revise the safety plan after each time is it used
- The plan is not a static document
- It should be revised as person's circumstances and needs change over time

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Promising or Emerging Interventions for those without a History of Neurodegenerative Disease
Brief Psychological Intervention after Deliberate Self-Poisoning
Collaborative Assessment and Management for Suicide (CAMS)
Cognitive Behavioral Therapy (CBT) for Suicide Prevention
Dialectic Behavioral Therapy (DBT)
Mentalization Based Treatment (MBT)
Problem Solving Therapy (PST)

Oneil et al., 2012; http://www.sprc.org/bpr/section-i-evidence-based-programs

J Head Trauma Rehabil
Vol. 26, No. 4, pp. 290–300
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Suicide Prevention After Traumatic Brain Injury: A Randomized Controlled Trial of a Program for the Psychological Treatment of Hopelessness

Grahame K. Simpson, PhD; Robyn L. Tate, PhD; Diane L. Whiting MPsychol (Clinical); Rachel E. Cotter, BA (Hons) (Psychol)

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

VA Window to Hope Team

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Funding provided by the Military Suicide Research Consortium through the Department of Defense

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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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Use Your Smartphone to Visit the VISN 19 MIRECC Website

Requirements:

1. Smartphone with a camera
2. QR scanning software (available for free download just look at your phones marketplace)

www.mirecc.va.gov/visn19