

RESEARCH REVIEW ON SUICIDE AND TRAUMATIC BRAIN INJURY

CURRENT MILITARY SUICIDE SUPPORT SERVICES

If you have an emergency or are in crisis, please contact the Suicide & Crisis Lifeline by dialing 988 (press 1 for Military Crisis Line/Veterans Crisis Line).

The following suicide resources are specific to the Department of Defense and U.S. Department of Veterans Affairs and are a vital resource for military personnel and veterans.

Table 1: Suicide resources

RESOURCE	ABOUT	CONTACT
988 Suicide & Crisis Lifeline	24/7 free and confidential nationwide support for all persons in suicidal crisis or emotional distress.	Call or text: 988 Chat online via website: 988lifeline.org
Military Crisis Line (MCL) and Veteran Crisis Line (VCL)	Free, confidential resource for all service members. Accessible 24 hours a day, 7 days a week. Expansion of the National 988 crisis line.	Call: 988 then press 1 Text: 838255 Chat online via website: www.veteranscrisisline.net/get-help-now/military-crisis-line/
inTransition	Free, confidential program that offers specialized coaching and assistance for active duty service members, National Guard members, reservists, veterans, and retirees who need mental health care when relocating, returning from deployment, transitioning from active duty to Reserve or Reserve to active duty, preparing to leave military service, transitioning between levels of care, or need a new mental health provider.	Website: Health.mil/inTransition
Military OneSource	24/7 support to service members, and eligible family members for non-crisis concerns, such as relationships, family, or financial concerns.	CONUS phone number: 800-342-9647 OCONUS phone number: 800-342-9647 or 703-253-7599 Chat online via website: www.militaryonesource.mil/

RESOURCE	ABOUT	CONTACT
Psychological Health Resource Center	Resource center for information and resources related to combat stress, depression, reintegration, how to get into treatment, types of treatment for mental health conditions, etc.	Call: 866-966-1020 Email: dha.ncr.j-9.mbx.intransition@health.mil Chat online via website: health.mil/PHRC
Real Warriors Campaign	A collaborative public health campaign between PHCoE and the Defense Suicide Prevention Office that provides service members, veterans, and their families with free mental health resources.	Website: health.mil/Military-Health-Topics/Centers-of-Excellence/Psychological-Health-Center-of-Excellence/Real-Warriors-Campaign

For additional resources, please visit the [Psychological Health Center of Excellence \(PHCoE\)](#) or [Defense Suicide Prevention Office \(DSPO\)](#) websites. PHCoE is one of the centers of excellence within the Research and Engineering Directorate of the Defense Health Agency that collaborates across the Department of Defense, Department of Veterans Affairs (VA), and other agencies to provide leadership and subject matter expertise in psychological health research informing policy and practice to enhance psychological health outcomes. DSPO was formed as an outcome of the Defense Health Board Task Force to provide a holistic approach to suicide prevention within the military through data surveillance, program assessment, advocacy, policy, and outreach & education.

PURPOSE

The purpose of this research review is to provide an overview of the state of the science regarding comorbid traumatic brain injury and suicide, as well as suicide attempts, with a focus on military personnel. Although differentiating symptoms of suicidal self-directed violence from other comorbid mental health conditions is inherently difficult, this review aims to present information relevant to understanding these co-occurring conditions. Specifically:

- What is the prevalence of death by suicide and the incidence of suicide attempts in the military?
- How does TBI affect the risk of suicide and suicide attempts in the military?
- What other factors affect the risk of suicide or suicide attempts in military members with a history of TBI?
- What are current recommendations for the detection, evaluation, and treatment of TBI and suicidality among service members and veterans?

This review will not address suicide prevention in populations with TBI, due to limited published peer-reviewed evidence. It also will not address cases in which a TBI is sustained during a suicide attempt.

The information in this research review is current as of January 2024 and is subject to change given emerging research and evidence.

TBI IN THE MILITARY – TBI DEFINITION AND PREVALENCE

A traumatic brain injury is defined in the *VA/DoD Clinical Practice Guidelines for the Management and Rehabilitation of Post-Acute Mild Traumatic Brain Injury* as a structural injury to the brain or a disruption of the normal physiological functioning of the brain resulting from an external force such as a blow, bump, or jolt to the head; an explosive blast; or a penetrating head injury.¹ TBIs are classified along a spectrum ranging from mild—also referred to as mTBI or concussion—to severe, based on the results of structural imaging (i.e., computed tomography), duration of loss or alteration of consciousness, duration of post-traumatic amnesia, and the Glasgow Coma Scale score.¹ Criteria classifying a TBI as mild includes normal structural imaging, 0–30 min of loss of consciousness, alteration of consciousness up to 24 hours, 0–1 day of post-traumatic amnesia, and a Glasgow Coma Scale of 13–15.¹ The majority of TBIs in the U.S. military population are classified as mild,² and data suggest this is true for the civilian population as well.³

Understanding the prevalence of TBI in the military is an important measure to determine how many service members are affected and to what extent TBI is a public health concern. Military personnel are at increased risk for TBI compared to their civilian counterparts, due to risks inherent in training activities, combat operations, and demographic factors.⁴ Between 2000 and the first quarter of 2023, 479,953 service members sustained TBIs, and the majority of those TBIs were mild (82.2%).² Unique to this time period was the U.S. response in support of Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and Operation New Dawn (OND), in which over 2 million service members were deployed.⁵ In a large retrospective analysis of service members (n=29,735) injured in theater and treated at a Role 3 Medical Treatment Facility or combat support hospital in Iraq and Afghanistan from 2002-2016, 32.4% sustained a TBI, with 75.8% being mild.⁴

SUICIDE NOMENCLATURE

The term suicide can be categorized as part of a broader group of behaviors and thoughts known as self-directed violence (SDV).^{6,7} In an effort to standardize suicide terminology across research and clinical settings, the Centers for Disease Control and Prevention created the SDV Classification System (SDVCS), which has since been adopted by the Department of Defense (DOD) and Department of Veterans Affairs (VA).⁷ Uniform terminology and definitions of suicide-related events facilitates an understanding of evidence-based findings across diverse research studies.⁸ ([Table 2](#)).

Table 2: Self-Directed Violence Terms and Definitions

KEY TERMS	DEFINITIONS
Non-Suicidal Self-Directed Violence Ideation	Self-reported thoughts of engaging in self-inflicted injurious behavior, with no evidence of suicidal intent.
Suicidal Ideation (SI)	Thoughts of engaging in suicide-related behavior. These thoughts can vary in terms of frequency, intensity, and duration.
Non-Suicidal Self-Directed Violence	Any action taken that is self-directed and intentionally results in injury or the potential for injury to oneself. There is no evidence of implicit or explicit suicidal intent.

KEY TERMS	DEFINITIONS
Suicidal Self-Directed Violence	Any action taken that is self-directed and intentionally results in injury or the potential for injury to oneself with evidence, whether implicit or explicit, of suicidal intent.
Suicide	Death resulting from self-directed injurious behavior with any intention to end one's life as a result of this action.
Suicide Attempt (SA)	A non-fatal self-directed and potentially injurious behavior with any intention to die as a result of this action.
Suicidal Intent	Past or present evidence (implicit or explicit) that an individual wishes to die, intends to kill themselves, and comprehends the probable consequences of their actions or potential actions. Suicidal intent can be determined retrospectively and inferred in the absence of suicidal behavior.

PREVALENCE OF SUICIDE AND SUICIDE ATTEMPTS AMONG ACTIVE DUTY MILITARY AND VETERANS

Suicide is a prevalent public health concern within the military community. According to the VA 2022 National Veteran Suicide Prevention Annual Report, veterans make up an estimated 8.2% of the U.S. population, yet account for nearly 14% of all reported suicide deaths in the U.S.^{9,10} There is an increasing trend in the suicide rate across all military branches, including Active Duty, Reserve, and National Guard; however, the rate has decreased slightly among active duty service members in recent years.¹¹ According to the most recent 2021 DoD Suicide Event Report (DoDSER), the adjusted rate of suicide among U.S. active duty service members was 22.8 per 100,000 compared to 26.8 per 100,000 in 2020.¹¹ The 2021 DoDSER demographic data reported 1,325 suicide attempts and 303 deaths by suicide across all service branches; however, the prevalence may be greater due to unreported incidents.

Among active duty personnel across all service branches, the plurality of service members who died as a result of suicide were male (93.7%), under age 25 (49.2%), White/Caucasian (74.3%), non-Hispanic (80.9%), and junior enlisted rank E1-E4 (49.2%) with some college education (85.5%).¹¹ Based on reported data, military occupations most at risk during this time period were enlisted infantry, gun crews, and seamanship specialists, which together accounted for 21.5% of all suicides. Recent literature has highlighted similar trends related to occupation and suicide among military personnel.¹² Additionally, epidemiological studies emphasize that junior enlisted (E1-E4) service members have a 1.58 times greater rate of suicide post-deployment compared to senior enlisted (E5-E9) service members, and a 2.41 times greater rate compared to officers.¹³ According to the 2021 DoDSER, 22.4% of individuals that died by suicide had deployed at least once, but 52.1% had no deployment history.¹¹ Some literature analyzing temporality of suicide indicates soldiers deploying during the first year of service may be more likely to die by suicide compared to those who deploy after the first year of service.¹⁴ Firearms were the most common mechanism of suicide among active duty service members (67.1%), members of the Reserve (74.3%), and members of the National Guard (76.1%) in 2021.¹¹

Comparable to active duty personnel, suicide rates among veterans are higher among males, individuals ages 18-34 years of age, and those who identify as White/Caucasian and Non-Hispanic.¹⁰ The most common mechanism of suicide among veterans since 2001 is firearms (71.0%). The suicide rate 12 months following separation from active duty was 47.8 per 100,000 veterans in 2019.¹⁰

In 2021, similar trends in suicide attempts (SA) were reported, but poisoning rather than firearms, was the most common mechanism among all active branches, National Guard, and Reserve. In addition, 54.5% of suicide attempts were among those 20-24 years of age, and females made up a larger proportion of SA (31.6%) compared to suicide deaths (6.3%).¹¹ Following separation from military service, some studies have found demographic, military service, and psychosocial characteristics appear to be predictors of SI, such as sex, age, race/ethnicity, rank, type of military separation, Veterans Health Administration use, and the presence of depressive, posttraumatic stress disorder, or anxiety symptoms.^{15,16}

RISK FACTOR DEFINITION

Any characteristic that increases the likelihood that an individual will consider, attempt, or die by suicide is considered a risk factor for suicide.^{17,18} For most, multiple risk factors, rather than one alone, are likely to influence the risk for suicide.^{17,19,20} The Interpersonal Theory of Suicide, a widely cited theoretical basis for understanding the causes of suicide, asserts that there are three factors that play a major role in suicides: thwarted belongingness, perceived burdensomeness, and capability to use lethal means. However, this theory has not been proven valid.^{21,22} There are multiple theories about the causes of suicide, and the risk for suicide appears multidimensional; thus no one construct alone is a sole predictor of the risk for suicide.²² Suicide research that focuses on one or a few risk factors may be inherently limited.

Many epidemiological-based cohort studies report suicide rates in person-years to consider the varying length of time individuals with TBI are surveilled until a suicide-related event occurs. Person-year measurements are reported when applicable in the studies in the sections below.

TBI AND THE RISK FOR SUICIDE

Understanding the risks or potential risks of suicide among military personnel with TBI is vital to optimize the health and readiness of U.S. service members.²³ The symptom presentation of neuropsychological conditions (i.e. depression and PTSD) is multifactorial and there is substantial symptom overlap between TBI and these conditions, including fatigue, sleep disturbances, poor concentration, irritability, as well as anger and aggression.²⁴ Psychological health conditions (e.g., depression or PTSD) may be present before or develop after TBI, and may affect suicide risk.²⁵

Population-level investigations have consistently found elevated rates of suicide in individuals with a positive history of TBI,^{25,26} however, the pattern of elevated risk for suicide after TBI in military and veteran populations has not been observed universally. Retrospective analyses of International Classification of Diseases (ICD-10) codes for cause of death of military members (active duty or activated Reserve) who received an mTBI diagnosis between 1999 and 2019 showed a crude death by suicide rate of 38.67 per 100,000 person-years.²⁷ Brenner et al. conducted a large-scale retrospective study of veterans who received care from the VA (49,626 with TBI history and 389,035 without TBI history).²⁸ They found that veterans with a history of TBI appeared 1.5 times more likely to die by suicide compared to veterans with no diagnosis of TBI. A more recent study by Brenner et al. also reported that time to suicide was 16.7% faster for those with a history of at least

one TBI (n=108,785) compared to those without a history of TBI (n=752,107). In a large-scale retrospective study including over 100,000 active duty enlisted male Marines, a TBI diagnosis prior to enlistment appeared to increase the probability of suicide 4.09 times that of those without a pre-enlistment TBI diagnosis.²⁹ Further, compared to those without a TBI sustained in service, TBI diagnosis during deployment in OEF/OIF appeared to increase the probability of suicide by 3.73 times, and 3.80 times for active duty personnel that did not deploy. Several studies have associated this apparent increased risk of suicide with moderate-severe TBI, as opposed to mild TBI.³⁰⁻³⁴ Health administrative data from 2,516,189 veterans that served after 9/11 revealed an apparent increased suicide rate of 46.9 per 100,000 person-years for those with mTBI and 81.5 per 100,000 person-years among those with moderate-severe TBI, both in comparison to a rate of 34.4 per 100,000 person-years for individuals with no TBI.³¹ Veterans with a moderate to severe TBI may be at highest risk for suicide within six months of TBI diagnosis.³² However, these studies were retrospective, not causal, thus no single risk factor or combination of risk factors are known to be predictive of suicide risk or probability at this time.

Similar to the 2021 DoD SER findings on mechanism of injury, a study among 230,000 service members found that those with moderate-severe TBI appeared to have a 33% increased risk of suicide by firearms compared to those with no TBI, after adjusting for demographics, psychiatric conditions, and other comorbid conditions.³³ In addition to firearms, researchers in this study found an apparent 65% increased risk of suicide by drug overdose among those with mTBI; however, this finding had a large confidence interval which indicates a higher level of uncertainty. Similarly, Hostetter et al. found an increased odds of suicide by firearms among veterans with moderate-severe TBI compared to those with mTBI or no TBI history.³⁴ These findings support the need for continued research and efforts to improve firearms safety, as indicated by the priority goal number one outlined in the 2021 White House report: Reducing Military and Veteran Suicide: Advancing a Comprehensive Cross-Sector, Evidence-Informed Public Health Strategy.³⁵

Suicide is a rare event. As previously stated, the rate of suicide in the military is 22.8 per 100,000.¹¹ As Franklin et al. argued, even if a person has an apparent threefold elevated risk of death by suicide, “in absolute terms they would still have a near-zero risk of dying by suicide that year.”³⁶ The studies cited here suggest that TBI might increase the risk of death by suicide by up to three- to fourfold, but the overall risk of suicide remains low for service members and veterans.³⁷⁻³⁹ Moreover, research has identified several factors that appear to reduce the chances that an individual will consider, attempt, or die by suicide regardless of TBI history. These factors are discussed below.

TBI AND THE RISK FOR SUICIDE ATTEMPTS OR SUICIDAL IDEATION

A constellation of risk factors likely influences suicidal attempts (SA) and suicidal ideation (SI) among military personnel and veterans.⁴⁰ Critical risk factors that may influence the relationship between TBI and suicide include comorbid psychiatric conditions, chronic pain, sleep disturbances, and comorbid phenotypes. Given that service members and veterans may have a higher risk of SI or SA after TBI, clarifying the relative risk of these factors is vital for screening, assessment, treatment, and prevention efforts.⁴¹

Comorbid Health Conditions

Among military service members and veterans with TBI, there is high comorbidity of psychiatric conditions,⁴² though the precise influence of TBI on the development and progression of these conditions is not fully understood.⁵ Several studies have consistently reported that comorbid

psychiatric disorders, such as major depressive disorder (MDD) and PTSD, appear to be risk factors for SI and SA following a TBI in service member and veteran populations,^{25,43,44} while others have found suicide after TBI to not be significantly associated.⁴⁵ TBI and co-occurring psychiatric conditions like PTSD have common clinical features that may lead to suicide ideation, attempts, or deaths. These overlapping signs and symptoms include depression, anxiety, irritability, insomnia, and memory deficits.⁴⁶ Cognitive dysfunction following TBI, such as deficits in attention, processing speed, memory, and executive functioning, may increase the risk of suicide, and the presence of psychiatric conditions such as PTSD may further worsen these symptoms.⁴⁷ In a study of 282 OEF/OIF/OND-era veterans with a history of mTBI, worse neuropsychological functioning (e.g., memory, attention/processing speed) was associated with greater risk of SI in veterans with three or more TBIs after controlling for comorbid PTSD, depression, and post-concussive symptoms.⁴⁷ Among those with any TBI history, MDD was also a significant predictor of SI. Fisher et al. analyzed data from the Injury and Traumatic Stress Consortium among active duty personnel, veterans, and civilians to examine the role of comorbid mTBI and PTSD on the risk for suicide (measured by current SI, lifetime SI, and lifetime suicidal behavior).⁴⁶ While findings indicated that individuals with either mTBI, PTSD, or comorbid mTBI+PTSD may be more likely to report lifetime SI or suicidal behavior compared to healthy controls, a history of mTBI did not suggest to significantly increase the risk of current SI beyond what was accounted for by PTSD alone. Events that cause both a TBI and PTSD (referred to as an index event) can be emotionally traumatic and mental health conditions (e.g., MDD and PTSD) resulting from these index events can manifest as a combination of physical brain injury and cognitive and affective symptoms.⁴⁸ Future studies investigating the epidemiological relationship between mental health and TBI may help explain the role TBI plays in suicide risk.

Multiple TBIs may also play a role in the relationship between mental health and SI. A retrospective study of 838 OEF/OIF/OND veterans found a relationship between SI and a history of multiple TBIs, after accounting for demographic factors and the presence of comorbid depression, PTSD, and poor sleep quality.⁴³ Compared to veterans that reported no history of TBI or one TBI, those with >1 TBI were 1.77 times more likely to report recent SI.

Several studies have highlighted the role of chronic pain in suicidal ideation and behaviors. Analysis of 3,247,621 veteran medical records from the Veterans Affairs Health Administration database from 2000-2010 revealed that the incidence of SAs was the highest among veterans with chronic headaches (329-491 per 100,000 veterans per year).⁴⁹ In this study, men with chronic headache appeared to have a 1.48 greater risk of SA, and women appeared to have a 1.64 increased risk of SA compared to healthy controls. Comorbid TBI seemed to elevate the risk of SAs (men: 2.82, women: 2.16). Different conclusions were made in a longitudinal retrospective study by Song et al. in which investigators studied the association between mTBI pain phenotypes and suicide (measured as SA and SI), as well as to what extent comorbidities influence this relationship.⁵⁰ In this study, pain phenotypes were a mixed measure of pain intensity scores, pain medication use, and other pain treatments from latent models (models of variables not observed in the study, but are inferred from data collected).⁵¹ Independently, mTBI pain phenotypes were statistically significant predictors of SI and SA; however after adjusting for sociodemographic factors and comorbidities (i.e., headache, back/neck pain, anxiety, depression, PTSD, insomnia, substance use disorder, attention impairment, and cognitive dysfunction), pain no longer appeared to be a significant predictor of SI or SA. Taking all current findings together, assessment, treatment, and management of these comorbidities and chronic pain are important clinical factors to consider for suicide mitigation, particularly in patients with a TBI.

There are conflicting findings in the literature on the role of sleep disturbances and disorders on suicide risk for military personnel with TBI. Insomnia and TBI history among active duty service members and veterans have been linked with the increased risk of suicidal thoughts and behaviors, suicidal intent, and likelihood of future suicidal intent.⁵²⁻⁵⁴ Poor sleep quality with a lifetime history of any number of TBIs appears to increase the odds of SI by 35% compared to those with poor sleep quality but no history of TBI.⁴³ A separate report of prospective data from the Army Pre/Post Deployment Study indicated that after controlling for pre/post deployment TBI and other covariates, pre-deployment insomnia was associated with an increased odds of post-deployment PTSD and SI by 3.14 and 2.78 times, respectively.⁵³ Obstructive sleep apnea (OSA) is a sleep disorder characterized by lower serotonin production, which, in turn, has been associated with suicide.⁵⁵ In collaboration with TBICoE, VA TBI Model Systems researchers investigated the relationship between OSA and suicide risk 1 year, 2 years, 5 years, and 10 years post-TBI, and found no significant relationship. In this study, OSA diagnosis was self-reported and OSA treatment data was unavailable.⁵⁶ The study's insignificant findings may be due to OSA being well-controlled through treatment, yet this cannot be objectively confirmed due to lack of individual treatment information. Without objective measures to supplement subjective reporting, the methodology introduces uncertainty in OSA group assignment. Despite OSA diagnosis being common among persons with TBI, there are few studies investigating the relationship between OSA, other sleep disorders (i.e., insomnia and sleep apnea), and suicide, indicating a topic for future research.

Deployment-related TBI

As mentioned [above](#), TBI is a common injury seen among military personnel that have deployed, and OEF/OIF/OND veterans are also at an increased risk of comorbid psychiatric conditions, including suicide, with some level of evidence that TBI plays a role. There is limited information however on whether comorbid psychiatric conditions are more common among service members that sustained a TBI while in theater and deployed vs. in other environments or while in garrison.⁵ A large prospective study of OEF/OIF veterans (n=273,591) receiving care from the VA found that the risk of suicide attempts was 25% higher among those with deployment-related TBI compared to those without a deployment-related TBI.⁵⁷ Further, 83% of the relationship between TBI and SAs was explained by comorbid psychiatric conditions (PTSD, mood disorder, anxiety disorder, and substance use disorder); the co-occurrence of PTSD appeared to be the strongest mediator and seemed to explain 72.7% of the association between TBI and SA. In other words, these psychiatric comorbidities appear to play a yet-to-be defined role in how deployment related TBI may or may not influence SAs.

In 2008, the U.S. Army and National Institute of Mental Health funded the Army Study to Assess Risk and Resilience in Service Members (Army STARRS) to address the rising rate of suicide among military personnel. Army STARRS was designed as a coordination of integrated studies across multiple institutions and has resulted in comprehensive datasets used to evaluate risk of suicide in the military.^{58,59} Recently, findings from the Army STARRS datasets have indicated that TBI prior to deployment may predict post-deployment SA in Army soldiers.⁶⁰ Utilizing survey data from the Army STARRS pre/post deployment survey, investigators evaluated post-deployment related risk factors for SA in a cohort of soldiers (n=7,677) that deployed to Afghanistan in 2012.⁶¹ Within five years of index deployment, those who had sustained a moderate to severe TBI appeared to have 2.08 greater odds of suicide attempts upon their return home. However, the data in this study does not clearly indicate whether the TBI was sustained during deployment or while in garrison.⁶¹ In a longitudinal study of 1,805 male active duty Marines and Navy service members deployed to Iraq

and Afghanistan, 3.9% (n=70) of individuals reported SI post-deployment.⁶² In this cohort, mild depression appeared to increase the odds of SI by 10.03 times. Prior deployment SI, prior deployment subthreshold PTSD, and deployment TBI were reported as significant risk factors associated with post-deployment SI; while TBI was not the strongest risk factor for post-deployment TBI, it still seemed to increase the odds of SI by 84% (OR: 1.839, 95% CI: 1.032-3.276). The association between TBI and SI is not uniformly observed, and a prospective study of three combat brigades (n=7,742) found that deployment related TBI did not appear significantly related to self-reported post-deployment suicidal ideation, plans, or attempts.⁶³

EVALUATING AND SCREENING FOR SUICIDE RISK – CURRENT VA/DOD GUIDANCE AND LITERATURE REVIEW

The Department of Veterans Affairs, DOD, and other professional organizations have developed clinical practice guidelines (CPGs) to facilitate evidence-based clinical care and reduce variation in clinical practice to improve outcomes. There have been two iterations of the VA/DoD CPG for the Assessment and Management of Patients at Risk for Suicide. The first version was developed 2013 and the second in 2019, with an update in progress as of June 2023. The VA/DoD CPG for suicide risk provides evidence-based recommendations for screening, evaluation, treatment, and risk management.

Screening for suicide risk should occur during primary care appointments, as mandated by the DODI 6025.04, *Standardization of Depression and Suicide Risk Screening in Primary Care During and Subsequent to the Coronavirus Disease 2019 Pandemic*.⁶⁴ Per the DODI 6025.04, a positive suicide risk screening should prompt referral to a Behavioral Health Consultant for further screening and evaluation as soon as possible. Screening for suicide-related behavior and suicide risk should follow validated and evidence-based methods.⁶⁵ The Patient Health Questionnaire (PHQ-9) is a nine-question tool that screens for depressive symptoms using Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria. It is a validated tool with high sensitivity and specificity;^{46,66} the evidence evaluated in 2019 VA/DoD CPG collectively supports the use of the PHQ-9, and specifically item 9 of that tool, for suicide risk: “*Over the past two weeks, how often have you been bothered by thoughts that you would be better off dead or of hurting yourself in some ways?*” It is important to note that while the PHQ-9 is a validated method for depression screening, one question is not clinically sufficient for conducting an assessment for suicide risk. Further, PHQ-9 item 9 only can assess service members and veterans for current SI, not lifetime suicidal behaviors or attempts. Note that the PHQ-9 remains valid after the 2013 DSM-V and 2022 DSM-V text revision updates as the criterion for MDD, which the PHQ-9 is based on, has remained unchanged.

Other screening tools such as the Columbia-Suicide Severity Rating Scale (C-SSRS) may be better suited for measuring lifetime SI and suicidal behavior.⁴⁶ During the past five years, the VA implemented and expanded the Suicide Risk Identification Strategy (Risk ID), a system wide standardized strategy and process for evidence-based screening of veterans for suicide risk and subsequent evaluation.⁶⁷ Risk ID is a two-stage process including screening via the C-SSRS followed by the VA Comprehensive Suicide Risk Evaluation. In 2020, the VA implemented a new policy to require an annual mandatory screening for suicide risk in all veterans under VA care.⁶⁸ Since implementation of Risk ID and the universal screening policy, there has been an increase in the number of veterans receiving screening for suicide risk while seeking health care services. Ninety percent of veterans recently screened in a VA primary care setting indicated that the setting was an appropriate place to be screened and assessed for risk of suicide, with varying degrees of agreement on how clinicians should deliver that screening.⁶⁹ Elevated scores as a result of these screening

methods should prompt interventions when clinically indicated to mitigate suicide risk and address related symptoms.⁷⁰

In the 2013 version of the VA/DoD CPG for Assessment and Management of Patients at Risk for Suicide, researchers recommended assessing patients for risk and protective factors related to suicide that appeared to reduce the odds an individual would consider, attempt, or die by suicide, regardless of TBI history.⁷¹ The 2019 CPG was revised to put less emphasis on protective factors and more emphasis on modifiable and non-modifiable risk factors, including screening for a history of TBI.⁷² Further, the VA/DoD CPG for Suicide highlights factors that are recommended for suicide risk evaluation are included in [Table 3](#), of which TBI is identified as a “physical health” risk factor.⁷² As mentioned [above](#), cognitive and psychological symptoms, including suicidal ideation, are common in TBI patients. Research on the association of the clinical triad of TBI, PTSD, and chronic pain with the risk of suicidal ideation endorses clinical assessment of all of these conditions.⁷³ Shura et al. evaluated the relationship between Personality Assessment Inventory (PAI) suicide scales and acute and chronic suicide risk factors (i.e., major depressive disorder, PTSD, and TBI) among Afghanistan and Iraq veteran service members.⁷⁴ The suicide scales used in this assessment included a suicidal ideation scale (SUI), Suicide Potential Index, and Chronic Suicide Risk Index (S_Chron). While all three risk factors were reported to be significantly associated with all three suicide scales, TBI appeared to have the smallest effect on PAI suicide scale scores. There currently is no one universally accepted instrument or method for determining risk of suicide, nor is the risk stratification quality of evidence robust enough to recommend one single tool or method for suicide evaluation.

PROTECTIVE FACTORS & TREATMENT

Protective Factors

Researchers have identified factors that appear to reduce the chances an individual will consider, attempt, or die by suicide, regardless of TBI status. The 2019 VA/DoD for Assessment and Management of Patients at Risk for Suicide CPG recommends assessing patients for protective factors related to suicide, but acknowledges that information on this topic is limited compared to information on risk factors.⁷² Since the last TBICoE Research Review on suicide and TBI in 2018, very little new research has been published on protective factors for suicide among military or civilian personnel with TBI. Recent research has suggested that social integration (i.e., feeling like a part of a community) may mediate the association between TBI and suicidality.⁷⁵ [Table 4](#) lists an overview of the protective factors reviewed in the literature.

The non-profit “Suicide Prevention and Resource Center” describes effective mental health care, connectedness to individuals, family, community, and social institutions, problem-solving skills, and contact with care providers as protective factors.¹⁷ A 2017 report by the National Center for Injury Prevention and Control highlights the importance of access to mental health services and suicide care as a means to reduce suicide risk factors.⁷⁶ A review centered on the military population cites social support, psychological factors such as resilience, and mental health treatment as protective factors.⁷⁷ In a qualitative study of military veterans with a history of TBI, history of mental health treatment, and history of suicidality, the most common factors cited as protecting against SA included social support (i.e., both the support of friends and family and feelings of responsibility for loved ones), a sense of purpose regarding the future, religion and spirituality, and mental health treatment engagement.⁷⁸ A multicenter study by Wilks et al. found TBI to be associated with SI in veterans with MDD and anger. However, veterans with self-reported anger and perceived to have

social support appeared two times less likely than those without social support to report SI, indicating a small but statistically significant protective effect [OR: 0.98, 95% CI: 0.98-0.99].⁷⁹ Given the confidence interval in this statistic was close to 1.0, the results should be interpreted with caution.

Activities that fulfill social and cultural connections and meaning may mediate the relationship between TBI and subsequent SI and SAs. Veterans with TBI, post-concussion symptoms, and a perception of less daily participation in role-fulfilling activities (e.g., personal role at work or home) have increased risk of suicidal thoughts.⁸⁰ The authors note that lack of participation after TBI may be due to physical, emotional, or cognitive limitations or restrictions. Their findings highlight that opportunities to engage veterans and service members in meaningful and health-promoting activities may mitigate suicide risk. A moderate to high level of resilience may decrease the odds of SI by 50-75% in service members following deployment.⁶²

Treatment

The 2019 VA/DoD CPG for Assessment and Management of Patients at Risk for Suicide makes several recommendations on how to treat and manage suicide risk in service members and veterans with comorbid conditions, including TBI.⁷² The treatment for both suicide risk and TBI may be done in parallel, as provided by the VA/DoD CPG for TBI.¹ Treatment plans for suicidal individuals with comorbid TBI should include evidence-based treatments for TBI in addition to evidence-based interventions for suicide. Current recommendations for comorbid mTBI and psychological/behavioral symptoms, including suicidal ideation/suicidal attempts, encompass psychotherapeutic and pharmacological treatment modalities.¹ The 2019 VA/DoD Assessment and Management of Patients at Risk for Suicide recommends cognitive behavioral therapy-based interventions focused on suicide prevention for patients with a recent history of self-directed violence to reduce incidents of future self-directed violence.⁷² While the current guidelines address a number of pharmacological and non-pharmacological treatments, they do not endorse specific treatments for persons with TBI history at risk for suicide.

Recently, studies have emerged investigating the use of repetitive transcranial magnetic stimulation (rTMS) as a potential intervention for suicidal ideation and comorbid depression, and cranial electrotherapy stimulation (CES) for complementary treatment of mTBI symptoms.^{1,81,82} The current CPG for concussion does not recommend for or against the use of these therapies, in part because there have been no studies investigating the safety and efficacy of CES and rTMS in persons experiencing SI with history of TBI. Novel approaches to existing treatment protocols may be required in order to appropriately treat the clinical complexity associated with comorbid symptoms and conditions.⁸³

There is currently a gap in the literature regarding treatment of comorbid TBI and suicide risk. A 2019 systematic review found no studies assessing the impact of treatments for suicidal ideation in service members or veterans with mTBI.⁶⁵ Despite this, some studies have explored feasibility of treatments and areas of research targeted to increase service utilization for service members and veterans with comorbid TBI and SI. Fortier et al. reported positive safety and feasibility for an online telehealth delivery of group mental health workshop for post 9/11 veterans that teaches cognitive-behavioral skills (problem solving, emotional regulation, and attention training). In this cohort, TBI patients were less prevalent compared to veterans with other psychiatric conditions, but results indicated that interventions offering veteran peer support are feasible and may help reach veterans that do not engage in traditional mental health treatment groups.⁸⁴ Recently, Pease et al.

assessed the impact of Cognitive Processing Therapy (CPT), a form of CBT developed to treat PTSD, on SI among veterans in three separate residential VA medical center treatment groups for PTSD: Men only, Women only, and TBI (including both men and women).⁸⁵ Only the men's program had significant pre-treatment to post-treatment decreases in SI, whereas the women's and TBI group showed non-significant decreases as a result of CPT treatment, indicating that additional aspects of TBI (e.g., memory deficits) and being a woman in the military may heighten the potential for SI further than the role of PTSD alone. Results from the 2019–2020 National Health and Resilience in Veterans study found TBI history to increase the odds of current SI by 1.49 and lifetime SA by 1.69 times compared to those with no history of TBI,⁸⁶ yet only 35.5% of those with SI in the study population were currently receiving mental health treatment. Among those with current SI, the majority that received most of their health care at the VA (54.7%) were more likely to be under current treatment than those who regularly sought medical care outside the VA (23.8%). In a 2019 TBI Model System study on mental health service use, researchers evaluated 155 service members and veterans with elevated mental health symptoms two years after a TBI and found that a greater percentage of service utilizers have used mental health services prior to their TBI (51%) compared to non-service utilizers (25%).⁸⁷ Given the scope of the literature, there is a need for further research on effective treatments for service members and veterans presenting with SI and a known history of TBI, as well as strategies to increase utilization of mental health services.

LIMITATIONS IN STUDIES

Several factors limit the ability of the published studies and guidelines to draw firm conclusions regarding the direct influence comorbid TBI has on suicide in military populations. The majority of the studies published on TBI and suicide are retrospective in nature, thereby limiting the reliability of the data and the ability to draw causal conclusions. Many studies used administrative health data which further limits the generalization of results to the entire military population,^{33,34,49,61} only patients who sustained TBIs that resulted in medical treatment were captured in these types of studies, which fail to represent the patient population that sustains less severe TBI. The use of distinct comparison groups in these retrospective studies may detract from confidence in findings as well; for instance, some studies used “non-injured” control groups, which is not equivalent to a “healthy control group,” or used control groups with mTBI and thereby controlled for the influence TBI has on suicide risk.²⁷ Finally, the majority of data collected on TBI, suicide, and other psychological health conditions was based on self-report and is correlational. Self-report data are susceptible to several biases, including social desirability that may influence willingness to self-disclose. The self-report format of studies is also dependent upon subjective interpretation of survey questions, recency of health symptoms and experiences, introspective self-assessment ability, and alterations in memory secondary to TBI or psychological health conditions. Further collection and analysis of longitudinal data likely will clarify the relationship between TBI and suicide.

KEY POINTS

- TBI, and other numerous psychological and behavioral health conditions, are important risk factors for suicide and suicidal thoughts and behaviors.
 - The degree to which TBI contributes to the risk is unclear, but evidence suggests that it may increase with TBI severity.
- TBI and mental health conditions (e.g., PTSD) may result from the same index event, or may occur before or after the onset of each other.

- Screen service members and veterans with a history of mTBI and comorbid PTSD for suicide risk.
- Consider risk and protective factors in the assessment and management of suicidal ideation and behaviors.
- Current treatment of suicidal thoughts and behaviors and TBI should follow the guidance provided in the most current VA/DoD CPG for mTBI and VA/DoD CPG for Assessment and Management for Patients at Risk for Suicide.

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Table 3: Risk factors for a comprehensive evaluation of suicide

CATEGORIES	FACTORS TO CONSIDER
Self-directed violence related	<ul style="list-style-type: none"> • Current suicidal ideation • Prior suicide attempt(s) • Preparatory behaviors • Past or present suicidal intent • Non-suicidal SDV behaviors
Current psychiatric conditions/current or past mental health treatment	<ul style="list-style-type: none"> • Mood disorders • Anxiety disorders • Psychotic disorders • Personality disorders • Substance use disorders • Eating disorders • History of psychiatric hospitalization
Psychiatric symptoms	<ul style="list-style-type: none"> • Hopelessness • Depressed mood • Anxiety/panic • Insomnia • Problem solving difficulties • Agitation • Anger • Rumination • Impulsivity • Intoxication • Decreased psychosocial functioning • Hallucinations
Recent biopsychosocial stressors	<ul style="list-style-type: none"> • Loss of a relationship • Loss of a job • Risk of losing stable housing/homelessness • Exposure to suicide • Traumatic exposure • Social isolation • Legal/disciplinary issues • Financial problems • Transition of care • Barriers to accessing care
Availability of lethal means	<ul style="list-style-type: none"> • Access to firearms • Access to other lethal means
Physical health conditions	<ul style="list-style-type: none"> • History of TBI with moderate to severe TBI being greater than mild TBI (concussion) • Cancer diagnosis
Demographic factors	<ul style="list-style-type: none"> • Lesbian, gay, bisexual, transgender sexual orientation, or gender identity

Table 4: Protective factors

CATEGORIES	PROTECTIVE FACTORS
Social context support system	<ul style="list-style-type: none"> • Strong interpersonal bonds to family/unit members and community support • Employed • Intact marriage • Child rearing responsibilities • Responsibilities/duties to others • A reasonably safe and stable environment
Positive personal traits	<ul style="list-style-type: none"> • Help seeking • Good impulse control • Good skills in problem solving, coping, and conflict resolution • Sense of belonging, sense of identity, and good self-esteem • Cultural, spiritual, and religious beliefs about the meaning and value of life • Optimistic outlook – Identification of future goals • Constructive use of leisure time (enjoyable activities) • Resilience
Access to health care	<ul style="list-style-type: none"> • Support through ongoing medical and mental health care relationships • Effective clinical care for mental, physical, and substance use disorders • Good treatment engagement and a sense of the importance of health and wellness