

Military TBI—What civilian primary care providers should know

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ABSTRACT

In June 2019, the Department of Veterans Affairs (VA) launched the VA Mission Act, which expanded veterans' health-care access to the private sector. Since civilian primary care providers may see more veterans in their practice, it will be important to understand the unique experiences, comorbidities, and culture of this population in order to provide optimal care. Military service members (SMs) are at an increased risk for traumatic brain injury (TBI), and comorbidities, such as post traumatic stress disorder (PTSD), increasing the likelihood of prolonged symptoms. Military training and repetitive low-level blast exposure may cause symptoms similar to TBI or increase long-term negative effects in SMs. Military culture often has a strong influence in this population. Those who serve in the military identify with military values and have a strong team mentality, which places emphasis on the mission above all else, not accepting defeat, and not ever leaving a fellow SM behind. These values can impact the way a SM/veteran seeks care and/or communicates with his or her health-care provider. Taking a detailed history to understand how these factors apply, as well as screening for mental health comorbidities, are recommended. Understanding the military cultural influences can assist in promoting a stronger therapeutic alliance and encourage more open communication. Ultimately, it is the trusting and respectful relationship between the SM/veteran and the provider that will determine the most effective treatment and result in the most effective resolution of TBI and comorbid symptoms.

Keywords: Concussion, health services needs, military, service member, traumatic brain injury, veteran

Introduction

In June 2019, the Department of Veterans Affairs (VA) launched the VA Mission Act, which expanded veterans' health care access to doctors within the private sector. This Act increased the number of veterans eligible to receive treatment in the private sector from 8% to 40% of the VA's 9.5 million patients.^[1] Each year approximately 200,000 U.S. military service members (SMs) transition out of the military and into civilian life.^[2] This

transition may present unique challenges as the veteran shifts to a new set of demands. Oftentimes, SMs and veterans are instilled with an ethos from the military culture that influences beliefs about seeking or obtaining assistance within the health care system. Although many veterans have healthcare access through the Military Health System and VA, only 34% pursue care through these resources.^[3] This means that a majority are obtaining their healthcare in the civilian sector, most likely primary care. It is therefore important for civilian primary care providers to have an understanding of military culture and recognize these influences to maximize treatment effectiveness and outcomes. Additionally, members of the Reserves, National Guard, and some Active Duty SMs obtain their healthcare in the civilian community.

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Traumatic brain injury (TBI) is second only to musculoskeletal injuries as one of the most prevalent injuries encountered in the military.^[4] Sustaining one or more TBIs is associated with the development of distinct comorbidities and physiological sequelae that can impair function and decrease quality of life. Therefore, TBI is an important factor to consider when assessing and treating veterans and SMs. In this article, we discuss the unique characteristics of military TBI, influences of military culture, and considerations for civilian practitioners and/or primary care providers who may treat SMs and veterans with persistent TBI-related symptoms. Understanding the differences between civilian and military TBI may inform prognosis and treatment and enables practitioners to provide more personalized care to achieve better outcomes.

Background

TBI is a major public health concern that can cause significant disability. In 2014, the Centers for Disease Control and Prevention (CDC) reported approximately 2.5 million TBI-related U.S. emergency department visits and 288,000 hospitalizations.^[5] Severity of injury can range from mild to severe and can have effects ranging from a few days to a lifetime. Symptoms can include impairment in cognition (e.g., memory and executive functioning), movement, vision or hearing, and emotional functioning (e.g., personality and mood changes).^[5] The lasting effects of TBI not only impact individuals, but may also cause significant disruption in the lives of families and their support systems, and in the military, can impact unit readiness. The nature of military combat and training increases the risk for sustaining a TBI, so it occurs more frequently among military SMs.^[6] According to the Traumatic Brain Injury Center of Excellence (TBICoE), more than 430,700 SMs were diagnosed with TBI between 2000 and 2020.^[7] Of these, 82.4% were classified as mTBI. Improvised explosive devices were the leading cause of mTBI in recent military conflicts, and for this reason, other injuries such as chronic pain and post-traumatic stress disorder (PTSD) often accompany it. This combination of injuries is common among SMs, and has been termed the “polytrauma triad”.^[6]

While approximately 80–85% of mTBI patients recover within one month after their injury, the remainder experience on-going symptoms that may last several weeks, years, or may not resolve at all.^[6,8,9] Some TBI symptoms may manifest later.^[10] PTSD is a common co-morbidity, and determination of the most appropriate and effective treatment requires an understanding of the relative contribution of PTSD to the symptoms observed in the TBI patient.^[11] Individuals with mTBI may experience persistent difficulty concentrating, increased fatigue, headaches, and disrupted sleep,^[10] all of which might be exacerbated when transitioning out of the military. Although much attention has been paid to the extensive medical and rehabilitation needs of patients with severe TBI, SMs are at a much higher risk for mTBI, and for that reason, we focus on mTBI in this article.

Causes and Frequency of TBI in the Military

The frequent use of explosive devices during Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) resulted in a high rate of mTBI in the military.^[12] TBI has been described as the signature injury of OEF and OIF.^[13,14] While the exact number of SMs who sustained TBIs from these conflicts is unknown, Swanson *et al.*^[15] reported approximately 20% of SMs returning from OEF/OIF had sustained a TBI. The VA has reported that 10 to 15% of SMs sustained a TBI in these conflicts.^[16] However, the actual incidence may be higher because some SMs may be reluctant to report a TBI as it is perceived as a “sign of weakness”.^[17]

In January 2008, a TBI question was added to the Post-Deployment Health Assessment (PDHA; DD Form 2796),^[18] a survey required to be completed within 30 days following return from overseas deployment, that helped to increase the detection of deployment related TBI. Questions 10 (a–c) on the form ask about potential causes of TBI (e.g., blast), alteration of consciousness at the time of injury, and about the presence of the typical signs and symptoms of TBI at the time of injury or now. During separation from the military, veterans are encouraged to make copies of their medical records, and may have this information readily available for the provider to review.

The risk for sustaining a TBI following a deployment is significantly increased compared to pre-deployment.^[10,19] Betthausen *et al.*^[10] and Regasa *et al.*^[19] suggested that the increased risk may be related to greater risk-taking behaviors after deployment, such as use/misuse of alcohol. During combat operations, military SMs are required to operate for extended periods in highly stressful environments, including exposure to violence and the threat of roadside bombs and improvised explosive devices (IEDs).^[20] Combat exposure may also increase the risk for mental health problems, such as PTSD, anxiety disorders, and major depressive disorder.^[20] Those with a greater lifetime number of TBIs may be at higher risk for increased symptom severity—possibly at a cumulative rate.^[21] Symptoms may be further exacerbated by comorbid health problems, and may even increase the risk for suicide.^[21] Hostetter and colleagues looked at the association between TBI and suicide in 215,610 veterans receiving care at Veterans Health Affairs (VHA) facilities from 2006 to 2015.^[22] Those with mTBI were 1.6 times more likely to commit suicide than those without mTBI. A recent review also found that TBI increased the risk of suicide in military SMs and veterans, especially in those with comorbid PTSD or depression.^[23]

Blast Exposure During Combat and Military Training

Blast injuries distinguish military TBI from civilian TBI. A recent study comparing rates of TBI in military SMs before and after deployment found that the highest proportion of TBIs occurred in combat, as well as military occupations that expose the SM to blast, such as infantry and artillery.^[19] Within those occupations,

55% of TBI resulted from blast exposure. Reid *et al.* found that blasts resulted in approximately 50 - 79% of all TBIs sustained in theater, among all occupations.^[6]

While it is well documented that those serving in combat operations are at higher risk for TBI and psychological injury, there is growing concern for SMs in specific occupational fields who may be routinely exposed to low-level blast.^[4] These blasts have lower explosive fields than IEDs, but still may expose SMs to overpressure waves that cause harmful effects. Breachers are routinely exposed to blasts when they use explosives to force entry into a building. In infantry, artillery and other combat occupational fields, SMs routinely fire heavy caliber weapons and munitions (e.g., artillery, recoilless rifles, and shoulder-mounted rocket launchers) that expose them to multiple low-level blasts. Although visible injuries may not occur, some SMs report symptoms, such as sleep disturbances and concentration problems, which may be indicative of mTBI.^[24] Over the course of a career, repeated low-level blasts may have cumulative effects.^[25]

MacDonald *et al.*^[8] compared SMs with blast and non-blast TBI and found that the blast groups reported worse headaches and more severe PTSD symptoms. They also found that the blast groups reported more intense combat exposure, which surprisingly did not correlate with the severity of PTSD symptoms. A study in a breacher cohort found that low-level blast exposure was associated with deterioration in neurocognitive performance, an increase in levels of serum biomarkers, as well as self-reported headache symptoms and poor long-term memory.^[24]

To gain a better understanding of blast effects on the brain, imaging techniques and serum biomarkers studies are being conducted. An magnetic resonance imaging study comparing cortical thickness in blast and non-blast subjects found significant cortical thinning in the blast group.^[26] Eierud *et al.*^[26] also found significant cortical changes in those with PTSD and neurobehavioral symptoms. In a recent review of 18 articles looking at low-level blast overpressure, Belanger *et al.*^[25] found one study with altered electroencephalogram activity, suggesting neural degeneration, and three functional magnetic resonance imaging (fMRI) studies with increased brain activation during a working memory task after exposure.^[25] However, it is important to note that the included studies had small sample sizes and considerable heterogeneity, which makes it difficult to compare results and draw firm conclusions. More clinical research is being conducted to understand this population, their exposure(s), potential cumulative effects, and any clinical utility of serum biomarkers and imaging techniques in informing outcomes and prognosis.

Comorbidities

Persistent postconcussive symptoms are multifactorial and may be related to neurological factors, pre-existing or comorbid

psychological problems, physical injuries, disruption in social roles, and/or perceptions of TBI.^[27] Although TBI comorbidities in the military are diverse, chronic pain and PTSD are likely the two most common and functionally disabling conditions.^[12] In a sample of 340 OEF/OIF SMs, Lew *et al.* found a high prevalence of chronic pain (81.5%), PTSD (68.2%), and postconcussive syndrome (66.8%).^[12] All three conditions occurred simultaneously in 42.1% of SMs and they rarely occurred in isolation.^[12]

Of OEF/OIF SMs and veterans seen at the VA, approximately 25% received a mental health diagnosis. Of these, PTSD was the most common.^[12] In a recent study involving 1,540 SMs and veterans with prior combat exposure, 50% of those with mTBI also were diagnosed with PTSD, but less than 24% of those without mTBI, received a PTSD diagnosis.^[28] SMs and veterans have a notably higher risk than civilians for experiencing comorbid PTSD and mTBI.^[29] This is not the scenario with sport-related concussion, where PTSD is rare. Evidence shows that the characteristics of PTSD symptoms are also impacted by military-specific environments, as combat-related mTBI is linked to increased PTSD symptom severity when compared to noncombat related mTBI.^[30] Exposure to blast, in particular, is associated with increased diagnosis and symptom severity of PTSD when compared to nonblast related mTBI.^[31] The cooccurrence of mTBI and PTSD can uniquely influence diagnoses, since they are each associated with symptoms including insomnia, fatigue, irritability, depression, anxiety, emotional numbing, avoidance, trouble concentrating, memory deficits, and hyperarousal.^[32]

This overlap of symptoms presents a challenge to the primary care provider to determine the predominant etiology—whether mTBI or PTSD. The correct diagnosis has obvious implications for the most effective treatment strategy. PTSD can also influence treatment and time to recovery, as well as symptom severity after mTBI, often leading to more disabling postconcussive symptoms.^[33-36] Therefore, special attention must be paid to the possibility of comorbid PTSD and mTBI in SMs and veterans. Many SMs diagnosed with PTSD report feeling a stigma about this “psychological” condition, and because of this are less likely to seek treatment, resulting in poorer mental health outcomes.^[37] Awareness of this presents an opportunity for primary care providers who may treat military-related TBI. The opportunity to treat the patient holistically without the stigma of a mental health clinic can be effective in initiating treatment in a nonthreatening manner.^[38]

Military Cultural Influences

SMs and the majority of veterans obtain their medical care from civilian primary care physicians so it is important for those providers to understand military culture. People who serve in the military identify with military values, traditions, language, and customs. They are often indoctrinated at a young age, and military culture can consume nearly every aspect of their

lives.^[39] Even veterans who served only a few years report strong identification with the military decades later.^[39] Key military values include selfless service, emphasis and focus on the mission, and contribution to the team for the good of the group.

The U.S. Armed Forces are unified by their primary mission to provide external defense, security, and protection, and each branch shares a unique core set of values and norms.^[40] The military values of honor, courage, and loyalty can influence the SM's views and positions about acknowledging injury and seeking treatment.^[41] Another unifying aspect of military culture is the warrior ethos. The Armed Forces' aim is to instill a mindset and group of values in their members which places the mission above all else, not accepting defeat, not ever quitting, and not ever leaving a fellow SM behind.^[41] The individual is an integral part of the small team (squad) which is part of the larger team (unit on a base or command). It may be perceived that time away from the squad (for medical appointments or feeling ill) is a sign of "weakness" and of "not being tough," which might disrupt the team cohesiveness and performance. Thus, use (and sometimes misuse/overuse) of over-the-counter medications, caffeine (particularly energy drinks) and perhaps, in some cases, alcohol, are viewed by some SMs as acceptable self-medicating options.^[42] In a DoD Health Related Behavior Survey, 25% of SMs endorsed moderate to heavy alcohol use.^[42] In a worldwide military survey, heavy drinkers were nearly ten times more likely than nondrinkers to use illicit drugs.^[42] Derefinko *et al.* found that this behavior may carry over into civilian life as a means to deal with health symptoms, such as headache, fatigue, sleep disturbances, and/or moodiness, which often occur as a consequence of chronic mTBI.^[42] As previously mentioned, the stigma of mental health issues may prevent acknowledgement of behaviors and symptoms. Symptoms may also manifest in more physical complaints when accessing a health care provider. Recognizing and having cultural competency may allow the practitioner to understand, appreciate, and interact positively with those who have served in the military. By optimizing communication and developing skills to promote a strong therapeutic alliance, treatment adherence and effective clinical care can follow.

Conclusion/Considerations for Civilian Practitioners

Primary care providers may be familiar and comfortable with screening, assessing, and treating mTBI patients, but may be less familiar with the unique aspects of a military TBI. As indicated above, mental health issues, and particularly PTSD, often occur with military TBI, so it is important to include mental health screening during the initial evaluation of the SM with TBI. Key features of PTSD are 1) reliving the incident, or flashbacks, 2) avoidance behavior, 3) hyperarousal, and 4) negative thoughts. The most common postconcussion symptoms are headache, sleep disturbances, dizziness, and concentration difficulties. Additionally, the primary care provider should ask about over-the-counter use of medications, supplements, caffeine

products, and use/misuse of alcohol/opioids/recreational drugs. Understanding the military cultural influences can help promote a stronger therapeutic alliance and encourage more open communication. Ultimately, it is the trusting and respectful relationship between the SM/veteran and the provider that will determine the most effective treatment and result in the most effective resolution of TBI and comorbid symptoms. The practitioner who understands the ethos of the SM/veteran will be the most effective in providing holistic health care.

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Conflicts of interest

The authors report no actual or potential conflicts of interest with regard to this article.

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Appendix: Resources for Civilian Practitioners to Learn More about Military Culture

Resource	Organization	Link to Resource
Understanding Military Culture	Substance Abuse and Mental Health Services Administration (SAMHSA)	www.samhsa.gov/sites/default/files/military_white_paper_final.pdf
Military to Civilian Readiness	Veterans Affairs (VA)	https://benefits.va.gov/TRANSITION/docs/military-to-civilian-readiness.pdf
Military Force Structures	Council on Foreign Relations (CFR)	https://www.cfr.org/background/modern-military-force-structures
Strengthening the Military Family Readiness System for a Changing American Society	The National Academies Press (NAP)	https://www.nap.edu/read/25380/chapter/1
PTSD Information	Veterans Affairs (VA)	https://www.ptsd.va.gov/
CME Online Courses		
Military Culture: Enhancing Clinical Competence Course	Uniformed Services University (USU) and Center for Deployment Psychology (CDP)	https://deploymentpsych.org/Military-Culture-Enhancing-Competence-Course-Description
Military Culture: Core Competencies for Health Care Professionals	Military Health System (MHS)	https://www.health.mil/Training-Center/DoD/Military-Culture-Training-for-Health-Care-Professionals--Introduction-and-Self-Awareness-Exercise