OEF/OIF Deployment-Related Traumatic Brain Injury

There is increasing concern that combat-related traumatic brain injury (TBI) may be a relatively frequent occurrence in the current conflicts (Operation Enduring Freedom [OEF], Operation Iraqi Freedom [OIF]). A recent study used the Joint Theater Trauma Registry to analyze the wounding patterns and mechanisms of combat wounds from OEF/OIF and compare them to previous conflicts (Owens et al., 2008). Reported changes in injury patterns for battle-related wounding were decreased numbers of thoracic injuries (OEF/OIF 5.9%, Vietnam 13.4%, World War II 13.9%) and increased numbers of injuries to the head and neck region (OEF/OIF 30.0%, Vietnam 16.0%, World War II 21.0%). A decrease in thoracic injuries was also seen in Operation Desert Storm (Owens et al., 2008). The widespread use of Kevlar body armor and helmets is one important factor (Okie, 2005). Reported changes in mechanisms of injury were decreased numbers of gunshot wounds (OEF/OIF 19%, Vietnam 35%, World War II 27%) and increased numbers of explosion-related injuries (OEF/OIF 81%, Vietnam 65%, World War II 73%) (Owens et al., 2008). Similarly, a study utilizing the Navy-Marine Corps Combat Trauma Registry found that 88% of combat-related TBIs involved exposure to explosions (e.g., improvised explosive device, mortar, mine, rocket-propelled grenade) (Galarneau et al., 2008). A study from the Defense and Veterans Brain Injury Center of returning soldiers treated at Walter Reed Army Medical Center reported that almost 60% of those injured by an explosion while deployed had a TBI (44% mild, 56% moderate-severe) (Okie, 2005).

It is important to understand that the occurrence and severity of TBI is defined by what happened at the time of injury. A TBI has occurred when an external force has significantly disrupted brain function as indicated by any of the following: a period of loss of consciousness or alteration in consciousness (e.g., confusion, disorientation); loss of memory (amnesia) for events immediately before or after the injury; neurological deficits (e.g., weakness, loss of balance, change in vision); or intracranial lesion. The presence/absence or duration of each of these defines the severity level. The joint Veterans Health Administration/Department of Defense clinical practice guidelines classified TBI severity on the basis of the American College of Rehabilitation Medicine (ACRM) definitions. Severe TBI requires loss of consciousness >24 hours; alteration of consciousness >24 hours; posttraumatic amnesia >7 days; Glasgow Coma Scale <9; and normal or abnormal structural imaging. Moderate TBI requires loss of consciousness >30 minutes but <24 hours; alteration of consciousness >24 hours; posttraumatic amnesia >1 day but <7 days; Glasgow Coma Scale 9-12; and normal or abnormal structural imaging. Mild TBI (concussion) involves loss of consciousness 0-30 minutes; alteration of consciousness momentary or <24 hours; posttraumatic amnesia 0-1 day; Glasgow Coma Scale 13-15; and normal structural imaging.

Research studies in civilian populations indicate that residual deficits are likely following both moderate and severe TBI, whereas most people recover fully following a mild TBI (McCrea et al., 2009). However, multiple studies indicate that a minority evidence long-term problems following even a mild TBI, although the causal link to the TBI is considered controversial by some groups.

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A recent set of studies used data from the Vietnam Experience Study to assess long-term outcomes following mild TBI compared to injury without TBI and no injury (Vanderploeg et al., 2005; Vanderploeg et al., 2007). Although the groups were similar on many measures, mild TBI was associated with sequelae including increased risk for depression, psychosocial problems, and subtle neurologic and neuropsychological deficits.

Two recent studies are of potential relevance to the OEF/OIF cohort, as they address issues related to experiencing more than a single concussion. One compared rates of recovery in athletes between their first and second concussion (separated by no more than one year) (Slobounov et al., 2007). Commonly measured symptoms (neurological, neuropsychological, clinical) resolved much more quickly (<10 days) than balance deficits measured in a virtual reality environment (>30 days), and recovery from the second concussion was significantly slower than from the first. The other reported elevated rates of abnormal imaging findings in combat sports (boxing, mixed martial arts) participants (Orrison et al., 2009).

The particular characteristics of the populations utilized in most TBI research studies may make extrapolation to the OEF/OIF cohort problematic. Research studies in civilians generally require confirmation of the injury by persons other than the patient (e.g., witness, emergency responder, emergency room personnel). As a result, most studies are based on populations that sought medical care (e.g., emergency room, specialty clinic) and thus represent only a portion of the population that has experienced a TBI. The injury context is also quite different, with few of the physical and psychological stressors that are common in the combat theatre. In addition, most studies involve recovery from a single injury event. The few studies of multiple injury events are almost entirely of sports-related concussions. The following summary concentrates on recent research articles (published by December 31, 2009) using OEF/OIF active duty military and/or Veteran populations.

A great deal of progress has been made in capturing data on injury patterns and medical treatment during deployments. Studies of initial treatment provided by battle aid stations in the forward combat theatre indicate exposure to explosions as the major injury mechanism (78-97%) (Gerhardt et al., 2009; Gondusky & Reiter, 2005). Most injured personnel were able to return to duty (RTD) rather than requiring out-of-theatre evacuation (14%-27% evacuated). One study reported an average of 3 days (range 0-30) for RTD (Gondusky & Reiter, 2005). Data from the Joint Theatre Trauma Registry for OEF/OIF combat-related injuries between October 2001 and January 2005 indicated that approximately 18% were RTD within 3 days (Owens et al., 2008). Data from the Navy-Marine Corps Combat Trauma registry for OIF between March 2004 and September 2004 identified 115 individuals whose injuries included TBI (71% wounded in action, 16% nonbattle injuries, 13% died of wounds) (Galarneau et al., 2008). Being wounded in action was associated with more severe TBI (e.g. skull fracture in 26% versus 0%), injury to more areas of the body (polytrauma), and a higher rate of evacuation (54% versus 33%) than RTD. A study comparing OEF/OIF Veterans receiving care at a VA Polytrauma Rehabilitation Center with combat-related TBI (74% explosion-related) to those with noncombat TBI (71% motor vehicle accidents) found higher report of vision impairments (>50% versus <30%), sensitivity to light or noise (~40% versus <10%), sleep disturbances (>50% versus <30%), and symptoms of acute stress reaction or PTSD (>30% versus <5%) (Lew et al., 2006). Hearing and/or visual impairments were present in 85% of a cohort of OEF/OIF Veterans with explosion-related TBI (40% mild, 20% moderate, 40% severe) (Lew, Garvert et al., 2009). A recent set of studies of combat-injured service members receiving inpatient care at a VA Polytrauma Rehabilitation Center between October 2001 and January 2006 reported that 97% had a TBI, more than half had issues related to mental health (symptoms of depression 36% PTSD 35%), and all had issues related to pain (headache 52%, musculoskeletal 48%, neuropathic 14%, other 23%) (Sayer et al., 2008; Sayer, Cifu et al., 2009).

Several studies have attempted to determine the overall rate of deployment-related TBI, which requires capturing information about all personnel, not just those who received medical care. Most studies of TBI in the OEF/OIF cohort soon after return from deployment have utilized brief screening questions, rather than a full assessment by an experienced TBI clinician (the present “gold standard”). The earliest study found that about twice as many deployed personnel (7.6%) gave a positive answer to a query about head injury with loss of consciousness compared to military personnel who were not deployed (3.9%) during the same time period (Vasterling et al., 2006). Three studies have reported on TBI screening of specific military populations (e.g., Brigade) soon after return from deployment (Hoge et al., 2008; Schwab et al., 2007; Terrio et al., 2009). Reported rates ranged from 15.2 - 15.8% (brief screen alone) to 22.8% (confirmed by clinical interview). A postal survey of OEF/OIF Veterans reported a rate of 12% (brief screen alone) (Schneiderman et al., 2008). The single population-based survey reported a rate of 19.5% (brief screen alone) (Schell & Marshall, 2008). Several studies included an assessment of TBI severity (Hoge et al., 2008; Schneiderman et al., 2008; Schwab et al., 2007; Terrio et al., 2009). All reported that the majority (59 -70%) were mild TBI (concussion) as indicated by alteration of consciousness (e.g., dazed, confused) rather than a loss of consciousness or posttraumatic amnesia. One study compared self-report of common post-concussion symptoms immediately after being injured (with or without TBI) and following return from deployment (Terrio et al., 2009). Sixty-five percent with injuries that included TBI and 9% with injuries without TBI reported experiencing two or more symptoms immediately following injury. Nineteen percent with TBI and 5% without TBI reported experiencing two or more symptoms following return from deployment. In the group with TBI, 75% had fewer symptoms post deployment.

Studies at later times following return from deployment provide some insight into the occurrence of long-term symptoms. Approximately 20% of OEF/OIF veterans completing the VA's brief TBI screen give positive answers to all four questions, indicating a probable historic TBI while deployed and possible persistent post-concussive symptoms (PPCS) (Lew, Otis et al., 2009). Veterans who screen positive are referred for a full evaluation by experienced clinicians as part of the VA's polytrauma program. Several VA sites have reported initial results from this follow-up evaluation. One found that 67% were confirmed to have PPCS, and more than 40% had PPCS, PTSD, and chronic pain (polytrauma clinical triad) (Lew, Otis et al., 2009). Another site reported that 85% were confirmed to have TBI (all but one mild), and that those with and without TBI were equally likely to have a diagnosis of service-connected PTSD.
(35% versus 36%) (Hill et al., 2009). At this site, Veterans with TBI alone (59%) and TBI with PTSD (71%) were more likely to report >3 current post-concussive symptoms than Veterans with PTSD alone (20%). Veterans with TBI and PTSD were more likely to report >3 exposures to injury while deployed (43%) than those with only TBI (15%) or PTSD (20%). Establishing a causal relationship between the historic TBI event and current symptoms is complicated in this cohort by the presence of psychiatric (e.g., PTSD, depression) and physical (e.g., chronic pain) conditions with symptom domains that overlap with TBI (Brenner, Vanderploeg et al., 2009; Howe, 2009; Iverson et al., 2009). Deployment to a combat theatre alone is associated with higher rates for these conditions (Polusny et al., 2009). The rates are further elevated in those who had been injured while deployed, and higher still in those whose injuries included TBI (Hoge et al., 2008; Schell & Marshall, 2008; Schneiderman et al., 2008).

Studies have used various approaches to determining the influence of co-occurring conditions on symptom presentation. Some have suggested that co-morbid psychiatric disorders may fully account for current symptoms (Hoge et al., 2008; Pietrzak et al., 2009). One study found differences in neuropsychological test performance between OEF/OIF Veterans with mild TBI alone and with both mild TBI and PTSD (Nelson et al., 2009). Presence of co-morbidities also increases the risk of suicide (Brenner, Homaifar et al., 2009). It is clear that co-morbid conditions influence symptom presentation and must be taken into account in both research studies and clinical treatment (Benge et al., 2009; Sandberg et al., 2009; Sayer, Rettmann et al., 2009). An integrated approach to assessment and treatment is presented in the joint Veterans Health Administration/Department of Defense clinical practice guidelines for mild TBI (Management of Concussion/mTBI Working Group, 2009). The mild TBI, PTSD, and chronic pain clinical practice guidelines can all be found at www.healthquality.va.gov. All VA clinicians have been encouraged to use these guidelines in developing their patient treatment plans.

Several excellent sets of review articles on TBI have recently been published. These sets include: (1) background articles developed by content experts for the VA’s Office of Research and Development 2008 state-of-the-art conference, published as a special issue of Journal of Rehabilitation Research and Development (2009 volume 46 issue 6); (2) proceedings of the 2008 International Conference on Behavioral Health and Traumatic Brain Injury, published as a special issue of The Clinical Neuropsychologist (2009 volume 23 issue 8); and (3) review articles developed by the Institute of Medicine in response to the VA’s request for an examination of the strength of the evidence for potential long-term health outcomes related to TBI, published as a special issue of the Journal of Health Trauma Rehabilitation (2009 volume 24 issue 6).

References


ABSTRACTS

Brenner, L. A., Homaifar, B. Y., Adler, L. E., Wolfman, J. H., & Kemp, J. (2009). Suicidality and veterans with a history of traumatic brain injury: Precipitating events, protective factors, and prevention strategies. Rehabilitation Psychology, 54, 390-397. Thirteen veterans with a history of TBI and clinically significant suicidal ideation or behavior were interviewed, and data were analyzed using a hermeneutic approach. Shared precipitants included loss-of-self post-TBI, cognitive sequelae, and psychiatric and emotional disturbances. Common protective factors included social support, sense of purpose, religion and spirituality, and mental health care. Means of improving care were also identified. Findings highlight potential areas of importance in the assessment and treatment of suicidal veterans with a history of TBI. [abstract adapted]

Gondusky, J. S., & Reiter, M. P. (2005). Protecting military convoys in Iraq: An examination of battle injuries sustained by a mechanized battalion during Operation Iraqi Freedom II. Military Medicine, 170, 546-549. Improvised explosive devices and mines pose a formidable threat to military convoys traveling in Iraq. In the period examined, 32 attacks injured 120 Marines, causing 188 injuries. Upper extremity and head injuries (70%) were common, whereas lower extremity injuries (11%) were rare. Shoulder and axilla protectors may be beneficial, but lower arm and hand injuries remain difficult to combat. Ear injury was the most common single injury type (23%). Combat earplugs may reduce ear blast injuries. Eye injuries were uncommon (0.5%), likely because of ballistic eye protection. Injury to the torso (11%) was generally mild, because of body armor vests. The majority of wounds were minor, allowing > 80% of the injured Marines to return to duty. [abstract adapted]

Hill, J. J., Mobo, B. H. P., & Cullen, M. R. (2009). Separating deployment-related traumatic brain injury and posttraumatic stress disorder in veterans: Preliminary findings from the Veterans Affairs traumatic brain injury screening program. American Journal of Physical Medicine and Rehabilitation, 88, 605-614. Medical records of all combat veterans in the VA Connecticut Healthcare System who both screened positive for traumatic brain injury (TBI) and received clinical evaluation for TBI during the first year of the VA TBI screening program were reviewed to explore the relationship between PTSD and self-reported symptoms attributed to deployment-related TBI. Of the 94 veterans with positive screens, 85% met the American Congress of Rehabilitation Medicine definition of probable TBI. Symptom reporting was similar for veterans with and without a history of TBI. Veterans with both PTSD and TBI were more likely to report falling as a mechanism of injury and indicated that they had suffered a head injury during deployment. Veterans with both PTSD and TBI reported more exposures and symptoms compared with veterans with a history of TBI. Veterans who screen positive for mild TBI by the VA TBI screening tool have high rates of PTSD, which suggests that interdisciplinary rehabilitation teams need to include mental health professionals with expertise in PTSD. Because both TBI and PTSD are defined, in part, by the same events and the same self-reported symptoms, the VA TBI screening tool does not distinguish between these two commonly reported diagnoses. [abstract adapted]
Hoge, C. W., McGurk, D., Thomas, J. L., Cox, A. L., Engel, C. C., & Castro, C. A. (2008). Mild traumatic brain injury in U.S. soldiers returning from Iraq. New England Journal of Medicine, 358, 453-463. We surveyed 2,525 U.S. Army infantry soldiers 3 to 4 months after their return from a year-long deployment to Iraq. Of 2,525 soldiers, 124 (4.9%) reported injuries with loss of consciousness, 260 (10.3%) reported injuries with altered mental status, and 435 (17.2%) reported other injuries during deployment. Of those reporting loss of consciousness, 43.9% met criteria for PTSD, as compared with 27.3% of those reporting altered mental status, 16.2% with other injuries, and 9.1% with no injury. Soldiers with mild TBI, 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. After adjustment for PTSD and depression, mild TBI was no longer associated with health outcomes or symptoms, except for headache. PTSD and depression are important mediators of the relationship between mild TBI and physical health problems. [abstract adapted]

Lew, H. L., Garvert, D. W., Pogoda, T. K., Hsu, P.-T., Devine, J. M., White, D. K., et al. (2009). Auditory and visual impairments in patients with blast-related traumatic brain injury: Effect of dual sensory impairment on Functional Independence Measure. Journal of Rehabilitation Research and Development, 46, 819-826. In this preliminary study of 175 patients admitted to a Polytrauma Rehabilitation Center, we diagnosed hearing impairment only, vision impairment only, and both in 19%, 34%, and 32% of patients, respectively. Only 15% of the patients had no sensory impairment. An analysis of variance showed a group difference for the total and motor functional independence measure (FIM) scores at discharge. Regression analyses demonstrated that dual impairment significantly contributed to reduced gain in total and motor FIM scores. [abstract adapted]

Lew, H. L., Otis, J. D., Tun, C., Kerns, R. D., Clark, M. E., & Cifu, D. X. (2009). Prevalence of chronic pain, posttraumatic stress disorder, and persistent postconcussive symptoms in OIF/OEF veterans: Polytrauma clinical triad. Journal of Rehabilitation Research and Development, 46, 697-702. Analysis of medical records of 340 OIF/OEF veterans seen at a VA Polytrauma Network Site indicated high prevalences of chronic pain, PTSD, and persistent postconcussive symptoms (PPCS) (81.5%, 68.2%, and 66.8%, respectively). Only 12 veterans (3.5%) had no chronic pain, PTSD, or PPCS. The frequency at which these three conditions were present in isolation (10.3%, 2.9%, and 5.3%, respectively) was significantly lower than the frequency with which they were present in combination with one another, with 42.1% of the sample being diagnosed with all three conditions simultaneously. The most common chronic pain locations were the back (58%) and head (55%). [abstract adapted]

Lew, H. L., Poole, J. H., Guillory, S. B., Salerno, R. M., Leskin, G., & Sigford, B. (2006). Persistent problems after traumatic brain injury: The need for long-term follow-up and coordinated care. Journal of Rehabilitation Research and Development, 43(2), vii-x. To determine the prevalence of problems faced by the TBI patients admitted to our Palo Alto VA facility, we performed an extensive chart review on 138 patients who had sustained closed head injuries. Of these patients, 71% returned for either the 1 or 2 year follow-up and 49% returned for both follow-ups. Of TBI patients who returned for both follow-ups, 90% or more had at least one problem in each category at baseline, i.e., during the first week of their inpatient admission for acute rehabilitation. During the following 2 years, the frequency of physical problems decreased from 100 to 84%, which indicates gradual but steady improvement in TBI patients' physical problems over time. Similarly, problems with community integration decreased in frequency from 90 to 77%. Cognitive and emotional issues declined <10% in frequency over the 2-year period. Of 66 consecutive TBI patients who had completed tours in Iraq or Afghanistan, 38 were wounded in combat and 28 sustained TBI in noncombat situations. Of those patients who sustained TBI during combat, 74% were victims of blast injury. Of the noncombat-injured soldiers, 71% were injured in motor vehicle accidents outside the war zone. All patients completed a 13-item inventory of postconcussive and posttraumatic distress symptoms. On average, noncombat-injured patients had 3.8 symptoms, while combat-injured patients had 5.7 symptoms. [abstract adapted]

Nelson, L. A., Yoash-Gantz, R. E., Pickett, T. C., & Campbell, T. A. (2009). Relationship between processing speed and executive functioning performance among OEF/OIF veterans: Implications for postdeployment rehabilitation. Journal of Head Trauma Rehabilitation, 24, 32-40. Comorbid mild traumatic brain injury (mTBI) with PTSD is a common clinical presentation among returning OEF/OIF troops. This study examined processing speed and executive functioning in a sample of OEF/OIF veterans who had sustained mTBI, a subset of whom also had comorbid PTSD. Fifty-three OEF/OIF veterans with a history of mTBI completed Wechsler Adult Intelligence Scale-III Symbol Search and Digit Symbol-Coding subscales, Stroop Word, color and color-word trials, and Trail Making Test, Parts A and B. Excluding from analysis those who scored poorly on effort testing, measures of processing speed accounted for 43% of the variance in performance on the Trail Making Test, Part B and 50% of the variance in performance on the Stroop task. Significant differences in processing speed and executive functioning were found on the basis of presence of comorbid PTSD. Stroop Color and Stroop Color Word scores differed significantly between the groups. Those having comorbid PTSD scored significantly poorer than the mTBI-only group. Implications for treatment of the comorbid conditions are discussed. [abstract adapted]

Orrison, W. W., Hanson, E. H., Alamo, T., Watson, D., Sharma, M., Perkins, T. G., et al. (2009). Traumatic brain injury: A review and high-field MRI findings in 100 unarmed combatants using a literature-based checklist approach. Journal of Neurotrauma, 26, 689-701. Seventy-six percent of the unarmed combatants had at least one finding that may be associated with TBI: 59% hippocampal atrophy, 43% cavum septum pellucidum, 32% dilated perivascular spaces, 29% diffuse axonal injury, 24% cerebral atrophy, 19% increased lateral ventricular size, 14% pituitary gland atrophy, 5% arachnoid cysts, and 2% had contusions. Statistical relationships
were found between number of bouts and lateral ventricular size, with years of fighting correlating with the presence of dilated perivascular spaces and diffuse axonal injury findings. The improved resolution and increased signal-to-noise ratio on 1.5- and 3.0-Tesla high-field MRI systems defines the range of pathological variations that may occur in professional unarmed combatants. Additionally, the use of a systematic checklist approach insures evaluation for all possible TBI-related abnormalities. This knowledge can be used to anticipate the regions of potential brain pathology for radiologists and emergency medicine physicians, and provides important information for evaluating unarmed combatants relative to their safety and long-term neurocognitive outcome. [abstract adapted]

Pietrzak, R. H., Johnson, D. C., Goldstein, M. B., Malley, J. C., & Southwick, S. M. (2009). Posttraumatic stress disorder mediates the relationship between mild traumatic brain injury and health and psychosocial functioning in veterans of Operations Enduring Freedom and Iraqi Freedom. Journal of Nervous and Mental Disease, 197, 748-753. This study evaluated whether PTSD mediated the relationship between mild TBI (MTBI) and general health ratings, psychosocial functioning, and perceived barriers to receiving mental healthcare 2 years following return from deployment in 227 OEF/OIF veterans. On the Connecticut OEF/OIF Veterans Needs Assessment Survey, 18.8% of the sample screened positive for MTBI. Compared with respondents who screened negative for MTBI, respondents who screened positive for MTBI were younger, more likely to have PTSD, more likely to report fair/poor overall health and unmet medical and psychological needs, and scored higher on measures of psychosocial difficulties and perceived barriers to mental healthcare. Injuries involving loss of consciousness were associated with greater work-related difficulties and unmet psychological needs. PTSD mediated the relationship between MTBI and all of these outcomes. These results underscore the importance of assessing PTSD in OEF/OIF veterans who screen positive for MTBI. [abstract adapted]

Polusny, M. A., Erbes, C. R., Arbisi, P. A., Thuras, P., Kehle, S. M., Rath, M. et al. (2009). Impact of prior Operation Enduring Freedom/Operation Iraqi Freedom combat duty on mental health in a predeployment cohort of National Guard soldiers. Military Medicine, 174, 353-357. One month before deployment to Iraq, 522 National Guard/Reserve (NGR) soldiers completed a survey assessing predeployment risk and resilience factors as well as current levels of PTSD, depressive, and somatic symptoms. Soldiers previously deployed to OEF/OIF reported more PTSD, depressive, and somatic symptoms. Previously OEF/OIF deployed soldiers reported lower perceptions of unit social support, but reported no differences in perceptions of preparedness or concerns about family disruptions. [abstract adapted]

Sayer, N. A., Chiros, C. E., Sigford, B., Scott, S., Clothier, B., Pickett, T., et al. (2008). Characteristics and rehabilitation outcomes among patients with blast and other injuries sustained during the Global War on Terror. Archives of Physical Medicine and Rehabilitation, 89, 163-170. In an observational study based on chart review and VA administrative data, 188 service members admitted to polytrauma rehabilitation centers (PRCs) were studied. Most war-injured patients had TBI, injuries to several other body systems and organs, and associated pain. Fifty-six percent had blast-related injuries, and the pattern of injuries was unique among those with injuries secondary to blasts. Soft tissue, eye, oral and maxillofacial, otologic, penetrating brain injuries, symptoms of PTSD, and auditory impairments were more common in blast-injured patients than in those with war injuries of other etiologies. The mechanism of the injury did not predict functional outcomes. Length of stay was variable, particularly for those with blast injuries. Patients with low levels of independence at admissions made the most progress but remained more dependent at discharge compared with other PRC patients. The rate of gain was slower in this low-functioning group. Blasts produce a unique constellation of injuries but do not make a unique contribution to functional gain scores. [abstract adapted]

Sayer, N. A., Cifu, D. X., McNamee, S., Chiros, C. E., Sigford, B. J., Scott, S. et al. (2009). Rehabilitation needs of combat-injured service members admitted to the VA Polytrauma Rehabilitation Centers: The role of PM&R in the care of wounded warriors. PM&R, 1, 23-28. To describe rehabilitation course, 188 acutely combat-injured service members suffering polytraumatic injuries requiring inpatient rehabilitation were studied. Ninety-three percent of the patients had sustained a TBI and more than half of these were incurred secondary to blast explosions. Over half of the patients had infections or surgeries prior to admission that required continued medical attention during their stay. Pain and mental health issues were present in 100% and 39%, respectively, of all patients admitted and added complexity to the brain injury rehabilitation process. Common treatment needs included cognitive-behavioral interventions, pain care, assistive devices, mental health interventions for both patients and their families, and specialty consultations, in particular to ophthalmology, otolaryngology, and neurology. Combat-injured polytrauma patients have complex rehabilitation needs that require a high level of specialized training and skill. [abstract adapted]

Sayer, N. A., Rettmann, N. A., Carlson, K. F., Bernardy, N., Sigford, B. J., Hamblen, J. L., et al. (2009). Veterans with history of mild traumatic brain injury and posttraumatic stress disorder: Challenges from provider perspective. Journal of Rehabilitation Research and Development, 46, 703-715. The VA has separate clinical structures and care processes for TBI and PTSD. We conducted key informant interviews with 40 providers from across the United States who represented separate clinical teams providing specialized TBI or PTSD services. We identified challenges providers perceive in scheduling and engaging patients with co-occurring mTBI and PTSD (mTBI/PTSD) in treatment, determining the etiology of patients’ presenting problems, coordinating services, and knowing whether or how to alter standard treatments. We found consensus that patients with mTBI/PTSD often have other morbidities requiring specialized treatment, including pain and sleep disturbance. Another important theme we found was the need for patient and family educational material and provider education tailored to provider specialty. Findings point to the need for guidance for providers on best practices to assess and treat mTBI/PTSD given available information, a systematic approach toward patient and
provider education, and research to build the evidence base for practice. [abstract adapted]

Schell, T. L., & Marshall, G. N. (2008). Survey of individuals previously deployed for OEF/OIF. In T. Tanielian & L. H. Jaycox (Eds.), Invisible wounds of war: Psychological and cognitive injuries, their consequences, and services to assist recovery (pp. 87-115). Santa Monica, CA: RAND Center for Military Health Policy Research. RAND conducted a large population-based survey to address gaps in the literature concerning the prevalence and correlates of mental health conditions and TBI stemming from service in OEF/OIF. To be eligible to participate in the survey, individuals must have been previously deployed as part of OEF/OIF and be reachable at a landline phone number within the United States during the study period. In total, 1,965 respondents completed an interview. Rates of exposure to specific types of combat trauma ranged from 5 to 50%. Direct injuries were reported by 10-20%. Rates of PTSD and major depression were both 14%. Rates of probable TBI during deployment were also high, exceeding 19%. Approximately 19% of respondents met criteria for either PTSD or major depression, and 31% met criteria for TBI, PTSD, or major depression. Excess morbidity attributable to deployment-related trauma exposure was approximately 12 percentage points for PTSD, 10 percentage points for depression, and 19 percentage points for TBI. [abstract adapted]

Schneiderman, A. I., Braver, E. R., & Kang, H. K. (2008). Understanding sequelae of injury mechanisms and mild traumatic brain injury incurred during the conflicts in Iraq and Afghanistan: Persistent postconcussive symptoms and posttraumatic stress disorder. American Journal of Epidemiology, 167, 1446-1452. A cross-sectional study of military personnel following deployment to conflicts in Iraq or Afghanistan ascertained histories of combat theater injury mechanisms and mild TBI and current prevalence of PTSD and postconcussive symptoms. Immediate neurologic symptoms post-injury were used to identify mild TBI. Adjusted prevalence ratios and 95% confidence intervals were computed by using Poisson regression. About 12% of 2,235 respondents reported a history consistent with mild TBI, and 11% screened positive for PTSD. Mild TBI history was common among veterans injured by bullets/shrapnel, blasts, motor vehicle crashes, air/water transport, and falls. Factors associated with PTSD included reporting multiple injury mechanisms and combat mild TBI. The strongest factor associated with postconcussive symptoms was PTSD, even after overlapping symptoms were removed from the PTSD score. [abstract adapted]

Schwab, K. A., Ivins, B., Cramer, G., Johnson, W., Sluss-Tiller, M., Kiley, K. et al. (2007). Screening for traumatic brain injury in troops returning from deployment in Afghanistan and Iraq: Initial investigation of the usefulness of a short screening tool for traumatic brain injury. Journal of Head Trauma Rehabilitation, 22, 377-389. To examine the utility of a new instrument, the Brief Traumatic Brain Injury Screen (BTBIS), 596 soldiers were assessed, and the consistency of their reports of TBI was compared across instruments with similar TBI questions, and in a brief follow-up interview. Self-reports of probable TBI were higher on the BTBIS than on the longer instruments. Participants who screened positive on the BTBIS generally provided consistent information about probable TBI in the follow-up interview. In this initial study, the BTBIS demonstrated promise as part of a triage process in mass casualty situations, permitting individuals with probable TBI to self-report injury and continued symptoms. [abstract adapted]

Terrio, H., Brenner, L. A., Ivins, B. J., Cho, J. M., Helmick, K., Schwab, K. et al. (2009). Traumatic brain injury screening: Preliminary findings in a US Army Brigade Combat Team. Journal of Head Trauma Rehabilitation, 24, 14-23. Members of an Army unit (n = 3,973) that served in Iraq were screened for history of TBI. Those reporting an injury (n = 1,292) were further evaluated regarding sequelae. Of the injuries suffered, 907 were TBIs and 385 were other types of injury. The majority of TBIs sustained were mild. A total of 22.8% of soldiers in a Brigade Combat Team returning from Iraq had clinician-confirmed TBI. Those with TBI were significantly more likely to recall somatic and/or neuropsychiatric symptoms immediately postinjury and endorse symptoms at follow-up than were soldiers without a history of deployment-related TBI. A total of 33.4% of soldiers with TBI reported 3 or more symptoms immediately postinjury compared with 7.5% at postdeployment. For soldiers injured without TBI, rates of 3 or more symptoms postinjury and postdeployment were 2.9% and 2.3%, respectively. In those with TBI, headache and dizziness were most frequently reported postinjury, with irritability and memory problems persisting and presenting over time. [abstract adapted]

CITATIONS

Benge, J. F., Pastorek, N. J., & Thornton, G. M. (2009). Postconcussive symptoms in OEF-OIF veterans: Factor structure and impact of posttraumatic stress. Rehabilitation Psychology, 54, 270-278. This study evaluated the Neurobehavioral Symptoms Inventory factor structure and assessed the impact of posttraumatic stress on the scale at the item and factor levels.


Galarneau, M. R., Woodruff, S. I., Dye, J. L., Mohrle, C. R., & Wade, A. L. (2008). Traumatic brain injury during Operation Iraqi Freedom: Findings from the United States Navy-Marine Corps Combat Trauma Registry. Journal of Neurosurgery, 108, 950-957. Those injured in battle were more likely than those not injured in battle to have multiple TBI diagnoses, a greater number of diagnoses, more severe TBIs, and to be medically evacuated. Intracranial injuries were the predominant type of TBI, although skull fractures and open head wounds were also seen. Improvised explosive devices were the most common cause of TBIs among battle injuries; blunt trauma and motor vehicle crashes were the most common causes among nonbattle injuries.

Howe, L. L. S. (2009). Giving context to post-deployment post-concussive-like symptoms: Blast-related potential mild traumatic brain injury and comorbidities. *Clinical Neuropsychologist, 23*, 1315-1337. In the military and VA systems, individuals with potential MTBI are presenting with symptoms in excess of what would be expected based on initial injury characteristics and/or at unexpected time periods based on current research findings. This article investigates factors that might account for the discrepancy.


Okie, S. (2005). Traumatic brain injury in the war zone. *New England Journal of Medicine, 352*, 2043-2047. According to this editorial, the war in Iraq has resulted in an unprecedented number of TBIs to soldiers, raising questions about how to provide the best long-term care for the survivors of these injuries.


Vanderploeg, R. D., Curtiss, G., & Belanger, H. G. (2005). Long-term neuropsychological outcomes following mild traumatic brain injury. *Journal of the International Neuropsychological Society, 11*, 228-236. Three groups matched on premorbid cognitive ability were examined, those who: (1) had neither been injured in an MVA nor had a head injury; (2) had been injured in an MVA but did not have a head injury; and (3) had a head injury with altered consciousness (MTBI). Compared with normal controls, the MTBI group evidenced attentional problems, left-sided visual imperceptions and impaired tandem gait.


The focus of this issue is on traumatic brain injury (TBI), which is the subject of a growing literature. At the moment, the PILOTS Thesaurus does not have a specific descriptor for this topic. Instead we apply the descriptor “Head Injuries” to papers about TBI, as it is the best fit with our existing controlled vocabulary. But it’s not a particularly good fit, because the phrase “traumatic brain injury” is increasingly used to describe the aftermath of a traumatic event rather than the event itself.

This sort of thing is not unusual. Language is a mutable thing: a term that was in use 20 years ago might seldom be heard today, and concepts unknown in 1990 may be headline news in 2010. We have been indexing the traumatic stress literature for 20 years, and during those two decades we have seen many changes in terminology.

We can confidently expect many more changes in the years to come. The forthcoming publication of DSM-V will in itself constitute a substantial modification of the language of psychiatry; and the dominant Western systems of nomenclature may be joined by rival systems from other parts of the world. As mental health issues increasingly impinge upon other disciplines, we are likely to see expansions to the specialized vocabularies of such fields as religion, law, and public policy.

As indexers it is our job to be aware of these changes, and to make provision for incorporating them into the PILOTS Thesaurus. We keep an ever-growing list of “candidate descriptors” and of possible changes in the relationships between existing descriptors. We record new “entry terms” for established descriptors, so that we can make it as easy as possible for thesaurus users to convert the words or phrases they might have in mind to the terms that will produce the best results for searching the PILOTS Database. And we consider whether descriptors that were established 20 years ago might have outlived their usefulness.

There is a balance that must be maintained between keeping our indexing vocabulary as up-to-date as possible and keeping it consistent enough that regular users do not have to re-learn it every time they use the database. We must try to distinguish between permanent changes in terminology and those that reflect a momentary enthusiasm or a blind alley. One clinician’s therapeutic innovation might generate a substantial literature — there are nearly 200 publications on EMDR in the PILOTS Database — while another’s might have no impact beyond its originator. When we index a paper that appears to break new ground, our practice is to apply the existing descriptors that most nearly cover its subject matter — and to list (in a non-public file) possible new terms that might better describe its content.

Every few years we publish a new edition of the PILOTS Database User’s Guide, which gives us the opportunity to revise the PILOTS Thesaurus. In preparing that revision we shall examine our candidate descriptors and the other terminological changes that have occurred to us during the course of our day-to-day indexing work. We shall also examine the existing thesaurus as a whole, considering how well its existing structure works and whether new patterns of relationships should be established. We need to determine whether the existing classification of therapeutic drugs is still useful and what we can learn from the work of bibliographical colleagues in cognate fields such as migration studies, refugee policy, and torture prevention and rehabilitation.

And, of course, we shall be consulting with experts on various aspects of traumatic stress studies. We intend to publish some of our proposals for changing our indexing vocabulary on the National Center’s website, and to solicit the views of anyone concerned. That certainly includes anyone reading these words — so please share with us your thoughts on improving the PILOTS Thesaurus.