

BRAIN INJURY

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Caring for Service Members, Veterans and Military Families Coping with Brain Injury

Resilience Related to TBI in the Military: An Overview

Conceptualizing Combat-Related Polytrauma and Rehabilitation: A Focus on Community Reintegration

New Guide for Caregivers of Service Members and Veterans

Virtual Reality Assessment of Cognitive Functions: A Promising Tool to Improve Ecological Validity

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editor in chief's message



Ronald Savage, EdD

“No matter how we personally feel about the wars, we must be committed to fully supporting our returning veterans , especially those who have been injured, no matter what the cost.”

Only three short years ago, the Defense Centers of Excellence for Psychological Health and TBI (DCoE) were established to improve the quality of care and address the complex needs of servicemembers who sustained traumatic brain injuries while serving in our armed forces. As we all know, many of the men and women deployed in Iraq and Afghanistan sustained TBI from improvised explosive devices (IEDs) and also experienced related psychological stress, including post-traumatic stress disorder (PTSD) and depression. For those specialists working with these servicemembers, the complexity of these multiple factors made it necessary for the military to expand their supports to complement the Veterans Hospitals and other military services. As importantly, no matter how we personally feel about the wars, we must be committed to fully supporting our returning veterans, especially those who have been injured, no matter what the cost.

In this special issue of *Brain Injury Professional*, Dr. Lolitta O'Donnell presents the six centers that comprise the DCoE, as well as its core functions and collaborations with military and civilian

agencies to promote resilience, recovery and reintegration for veterans with traumatic brain injury. The BIP authors cover a range of issues, supports and services that are provided by DCoE. In particular, Dr. James Kelly, Director of the National Intrepid Center of Excellence, is interviewed. Dr. Kelly is well known to brain injury professionals for his expertise and years of dedication to his patients. Dr. Kelly presents his team-driven and family-centered approach to the rehabilitation of veterans with TBI, including the use of alternative therapies.

NABIS wishes to thank Dr. O'Donnell and her authors for an excellent issue of *Brain Injury Professional* detailing the services provided by DCoE. The work done by these dedicated professionals is truly appreciated and honored.

As this issue goes to press, we are hard at work putting the finishing touches on our annual meeting which this year is a joint effort between NABIS and the National Association of State Head Injury Administrators (NASHIA). This unique collaborative effort has brought together some of the leading experts in brain injury rehabilitation and service delivery together at one ground-breaking event. The board of NABIS thanks our colleagues at NASHIA for working with us to produce what was clearly an important and much needed educational event for the brain injury community.

Ronald Savage, EdD

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guest editor's message



Lolita T. O'Donnell, PhD, RN, Deputy Director, DCoE Clearinghouse, Outreach and Advocacy Directorate

Thank you for reading this important issue of *Brain Injury Professional Magazine*, which highlights many of the central issues our nation faces in caring for service members, veterans and military families coping with the effects of a traumatic brain injury (TBI). In this issue, you will read about some of the groundbreaking work that the Department of Defense (DoD) Defense Centers of Excellence for Psychological Health and TBI (DCoE) is conducting to improve the quality of care for those who have experienced a TBI while serving our nation in the armed forces.

In 2009 alone, the military saw 27,862 total instances of TBI, according to the Defense and Veterans Brain Injury Center, one of DCoE's six component centers. Increased instances of TBI are often attributed to the use of improvised explosive devices (often referred to as "IEDs"), among other factors. Unfortunately, this injury has become known as one of the "signature wounds" of the conflicts in Iraq and Afghanistan. That is why it is critical that health professionals throughout the military and civilian sectors receive the best possible information for treating service members and veterans who have experienced these wounds.

DCoE was established in November 2007 to advance the quality of care for those experiencing concerns related to TBI, as well as psychological health issues like combat stress and depression. As part of the Department of Defense's Military Health

System, DCoE's mission is to promote the resilience, recovery and reintegration of service members, veterans and military families. The three-year-old organization is composed of the following six component centers:

1. Center for Deployment Psychology
Promotes the training of military and mental health professionals
2. Center for the Study of Traumatic Stress
Provides knowledge, leadership and applications for recovering from disaster and trauma
3. Defense and Veterans Brain Injury Center
Develops and delivers advanced TBI-specific treatment and surveillance
4. Deployment Health Clinical Center
Improves deployment health through assistance, treatment, advocacy and education
5. National Center for Telehealth and Technology
Leverages technology to increase access and advance care warriors and their families in all locations
6. National Intrepid Center of Excellence
Dedicated to advanced research, diagnosis and treatment planning for TBI and psychological health

DCoE integrates its core functions across eight directorates to coordinate capabilities and ensure quality of care. These directorates include:

- Clearinghouse, Outreach and Advocacy
- Communications
- Psychological Health Clinical Standards of Care
- Research and Program Evaluation
- Resilience and Prevention
- Strategy, Plans and Programs
- TBI Clinical Standards of Care
- Training and Education

This issue of *Brain Injury Professional Magazine* features articles from several of DCoE's component centers and directorates, which actively collaborate to share resources and drive improvements in TBI care across the Military Health System. DCoE also actively collaborates with the Department of Veterans Affairs, the armed services, civilian agencies, community leaders, advocacy groups, clinical experts and academic institutions to provide a number of services that promote resilience, recovery and reintegration — some of which are

highlighted in this issue.

Resilience is an important factor in one's recovery from a brain injury. The article "Resilience Related to TBI in the Military: An Overview," contributed by DCoE's Resilience and Prevention Directorate, provides an excellent summary of our understanding of — and approach to — resiliency in service members and veterans. And DCoE's Department of Veterans Affairs Liaison, Jay M. Uomoto, Ph.D., authored a very interesting article titled "Conceptualizing Combat-Related Polytrauma and Rehabilitation," which discusses in detail the needed focus on community reintegration when supporting warriors' recovery after a TBI.

Our work has also shown us the critical role of the family members in one's recovery from a TBI. The article, "New Guide for Caregivers of Service Members and Veterans," discusses an exciting new training program for military families implemented by the Defense and Veterans Brain Injury Center. Furthermore, Dr. James Kelly, the director of the National Intrepid Center of Excellence, discusses the importance of the family in his new organization's approach to treatment. (The National Intrepid Center of Excellence, which opened in June 2010, features a dedicated "Fisher House," to provide lodging for warriors and their families during treatment.)

Because our understanding of treatments for TBI is constantly evolving, DCoE is also dedicated to developing state-of-the-art approaches to TBI treatment in the military and beyond. The leaders of the National Center for Telehealth and Technology have contributed a promising article about the use of virtual reality technologies in the assessment of cognitive functions. Another emerging trend, the relationship between recurrent concussions in both the military and sports, is examined in-depth by Lt. Cmdr. Tara A. Cozzarelli of DCoE's TBI Clinical Standards of Care Directorate.

DCoE's work in relation to resilience, the role of the family, emerging treatment concepts, and other areas of care for TBI is all conducted with one singular goal in mind: to improve the quality of care for service members, veterans and military families that have experienced the effects of TBI. Thank you.

**Lolita T. O'Donnell, PhD, RN,
Deputy Director, DCoE Clearinghouse,
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DEFENSE CENTERS OF EXCELLENCE

For Psychological Health & Traumatic Brain Injury

RESILIENCE RELATED TO TBI IN THE MILITARY: AN OVERVIEW

BY THOMAS A. VAN DILLEN, PhD

Introduction:

Created in November 2007, the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE) brings together eight directorates and six component centers. Their joint goal is to maximize opportunities for warriors and families to thrive through a collaborative global network, promoting resilience, recovery and reintegration for psychological health (PH) and traumatic brain injury (TBI).

The mission of the Resilience and Prevention Directorate of DCoE is to help service members and families build resilience, which is defined as, “a set of actions and attitudes that prepare individuals and groups for adapting to challenging situations, establishing a ‘new normal’ and realizing one’s potential for growth.” In service to this mission, a model of Total Fitness has been developed that incorporates the resilience continuum (Bates, et al., 2010). The resilience continuum is meant to re-focus the mindset of leaders, soldiers and care providers from pathology and illness to resiliency and thriving. The Total Fitness model is a larger attempt to address all aspects of military readiness and across operational environments.

Scope of the Problem

Since 2009, it is estimated that over 5,000 U.S. troops have died and 35,000 more have been wounded in action during Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) (www.defenselink.mil/news/casualty.pdf). Many of our soldiers are surviving what used to be catastrophic, life threatening injuries, but they are often left with difficult recoveries, the majority of which are mild TBIs and post-traumatic stress disorder (PTSD). Approximately 80 percent of TBI diagnoses are associated with closed head injuries incurred as a result of blasting or other activities not directly combat-related (Ranchand et al., 2008).

In a comprehensive review of TBI and its prevalence, RAND reports a “probable” TBI prevalence rate of 19.5 percent. However, estimates have been as high as 22.8 percent for soldiers in an Army brigade combat team returning from a one year deployment to Iraq (Terrio et al., 2009). Moderate to severe TBIs are estimated to be around 10 percent; however, these rates are difficult to validate as the measures themselves have not always been accurate, nor has there been clarity on the diagnostic criteria of TBI. An additional complexity in diagnosing TBI is the overlap of PTSD symptoms that often accompany combat (Hoge, et al., 2009).

Both TBI and PTSD may be diagnostically difficult to distinguish due to the shared neuroanatomical structures, similarity of symptoms, and the fact that service members do not often seek help for fear of being pulled out of the fight and stigma surrounding mental health issues (MHAT, 2008). At the same time, policy makers have increased the focus on efforts to address the needs of these injured service members, raising the level of due diligence to take steps and incorporate procedures that screen for these problems, thus increasing the chances of over diagnosing these problems (Hoge, et al., 2009).

TBI

TBI, defined in the medical literature as a disruption in brain function that is caused by a head injury, has become known as one of the “signature wounds” of the wars in Iraq and Afghanistan due to its high occurrence in post-deployment service members and veterans of these wars (Ranchand et al., 2008). It is also known as the “hidden” injury because service members can sustain injury to the brain without being detected and later developing symptoms that can affect a soldier’s functioning (Tanielian et al., 2008).

At the time of injury, or sometime after, TBI could be clas-

sified as mild, moderate or severe.

Mild TBI may cause a brief period of unconsciousness, mild confusion or discomfort, while a more severe injury may cause longer periods of unconsciousness, nausea, vomiting, loss of coordination or other symptoms. Moderate TBI may be diagnosed when the patient experiences a loss of consciousness for less than 24 hours, and up to one week of post-traumatic amnesia. A TBI injury may be classified as severe if it involves more than one day of unconsciousness or more than one week of amnesia (Terrio et al., 2009).

The perceived severity of the injury depends on a number of factors. Clinically, severity of TBI is measured by the Glasgow Coma Scale, seven levels of unconsciousness, and the extent of post-traumatic amnesia. TBI severity may range from “mild,” a brief change in mental status or consciousness after the injury, to “severe,” an extended period of unconsciousness or amnesia. In addition to physical symptoms, mental health diagnoses such as PTSD, depression and anxiety are common for TBI patients, as well as substance abuse. Due to the variable nature of TBI injury and recovery, there is not one standard of care or treatment regimen for TBI; patients’ needs are diverse, depending on the illness severity and the presence of co-conditions (Taber and Hurley, 2010; Tanielian et al., 2008).

TBI in service members does not always come from combat, although blast injuries have received a lot of attention because of the current enemy’s frequent use of explosives that result in blast injuries. Most of these injuries are characterized as mild TBI. In fact, however, most closed head injuries are due to car and motorcycle accidents, training accidents and falls. These injuries can be catastrophic and result in life-changing cognitive problems in the areas of attention, concentration, memory, language processing, perceptual skills, problem solving and judgment, interpersonal skills and emotional functioning. In addition, physical problems that include motor and gait difficulties, headaches, sleep problems and pain can persist, presenting a particular challenge for rehabilitating TBI patients and their families (Adams, 1996). Mild TBI patients have shown the most complete recoveries but, for the majority of those with moderate to severe brain injuries, complete recovery of prior functioning is never achieved (McGrath, 2007).

Studies have shown that patients with mild TBI can make a complete recovery with little or no medical intervention. One study noted that patients with mild TBI recovered more quickly when provided with information on types of symptoms to expect. Other patients need more time and resources, and the nature of those needs varies on a case-by-case basis (Deb et al., 1999; White et al., 2008). In the civilian population, four types of outcomes have been identified for patients with moderate head injuries. Approximately 60 percent of patients with moderate head injuries make a positive recovery; an estimated 25 percent will be left with a moderate degree of disability; death or a persistent vegetative state will be the outcome in about 7-10 percent of all cases; and the remainder of patients will have a severe degree of disability which will range from comas

to needing long term care and assistance (Hoge et al., 2008; Taber and Hurley, 2010).

Resilience

There are no universally accepted scientific definitions of resilience, although resilience has been increasingly recognized as a distinct domain of inquiry (Cicchetti, 1989, 1993; Masten et al., 1990, 1999, 2001). The theoretical models underpinning such literature are not always explicit, but the various definitions of resilience tend to share in common a number of features including adaptive coping, growth, strength and positive outcomes following exposure to adversity (e.g., Rolf and Johnson, 1990; Rutter, 1990; Richardson, 2002).

The point is that resilience is a multi-dimensional construct. Resilience is best understood in context of the environment as each area of adversity needs to be considered in relationship to the individual. This is due to the fact that resilience can be different things in different environments. By specifying the dynamics of the individual and his or her situation, we will better delineate the construct of what is protective and resilient. The focus of this construct is on those things that make soldiers better at what they do and how they do it within a given extreme environment or environments (Bates et al., 2010; Van Dillen et al., 2010).

We know that certain aspects of behavior and thinking are protective and others do not pan out. This may make a service member vulnerable or not vulnerable. The individual, environment and interacting factors have shown to contribute to resiliency. Individual factors would include personality traits such as flexibility, adaptability, openness to experience and extraversion (Frederickson, 2001), intelligence (Masten et al., 1999), solution-focused problem solving (Garmezy, 1991), optimism, hope, creativity, faith, forgiveness and self-esteem (Richardson, 2002). Environmental factors have included sufficient social support to help problem solve and facilitate self correction (Masten et al., 1999). There has been little to no research on interactive factors that address the interactions between the individual and the environment (Masten, 2001; Curtis and Cicchetti, 2003).

Resilience can mean different things depending on the injury. The level of functioning is limited by the degree or severity of injury. In the most severe cases, it is the environment that needs to be modified so the person can adapt and obtain the highest level of functioning possible. That is, the level of function at which we can achieve is variable from individual to individual and is affected by many other factors. As such, our environments impact us and can overwhelm even those with the best functioning, depending on how compromised their nervous systems are. There is no other environment more challenging and extreme than combat to test nervous system functioning. (Van Dillen, 2010).

Resilience and TBI

Resilience, as discussed, refers to how an individual reacts and adapts to a traumatic event, usually bouncing back to their prior level of functioning before the traumatic event. There are those

When it comes to the treatment of brain injuries from the point of injury to years after injury, focusing on the patient and what they want for themselves in the future is the most appropriate approach. Focusing on the past and how current problems arose because of what happened is not as productive as looking at what the patient can do to improve him or herself and invest towards the future.

who also appear to be able to take an extraordinarily difficult event and somehow find the opportunity to improve and even excel (Bartone, 2006).

Problems associated with TBIs are well documented in the literature. Studies which have followed patients beyond one year post-injury indicate that these problems can be both persistent and disabling (Deb, S., et al. 1999). Residual psychological, emotional and cognitive deficits have prevented them from returning to pre-functional levels. However, long-term adjustment after brain injury is achievable even after severe TBI (McGrath, 2001). As a result, researchers are now beginning to examine the positive psychological outcomes after brain injury. This begs the question, in cases of TBIs where the brain itself is actually injured and rendered impaired, can those who suffer this kind of catastrophic injury also possess the ability to bounce back and even thrive?

Although there is a great paucity of research in this area, recent studies do suggest that those who are survivors of brain injury are capable of positive growth. In one of the first systematic studies that examined whether people with acquired brain injury (ABI) show evidence of psychological growth and positive change, they found that in fact positive growth does appear to occur over time (McGrath and Linley, 2006). Additionally, Powell et al. (2007) found that positive growth occurs later (10 years) than earlier (1-3 years) in recovery. Hawley and Joseph (2008) in a longitudinal study of moderate to severe TBI survivors, compared scores for up to three years after recruitment and found that many of these patients continued to have residual problems associated with the brain injury. However, a sub-set of the original cohort (total of 165 patients) assessed

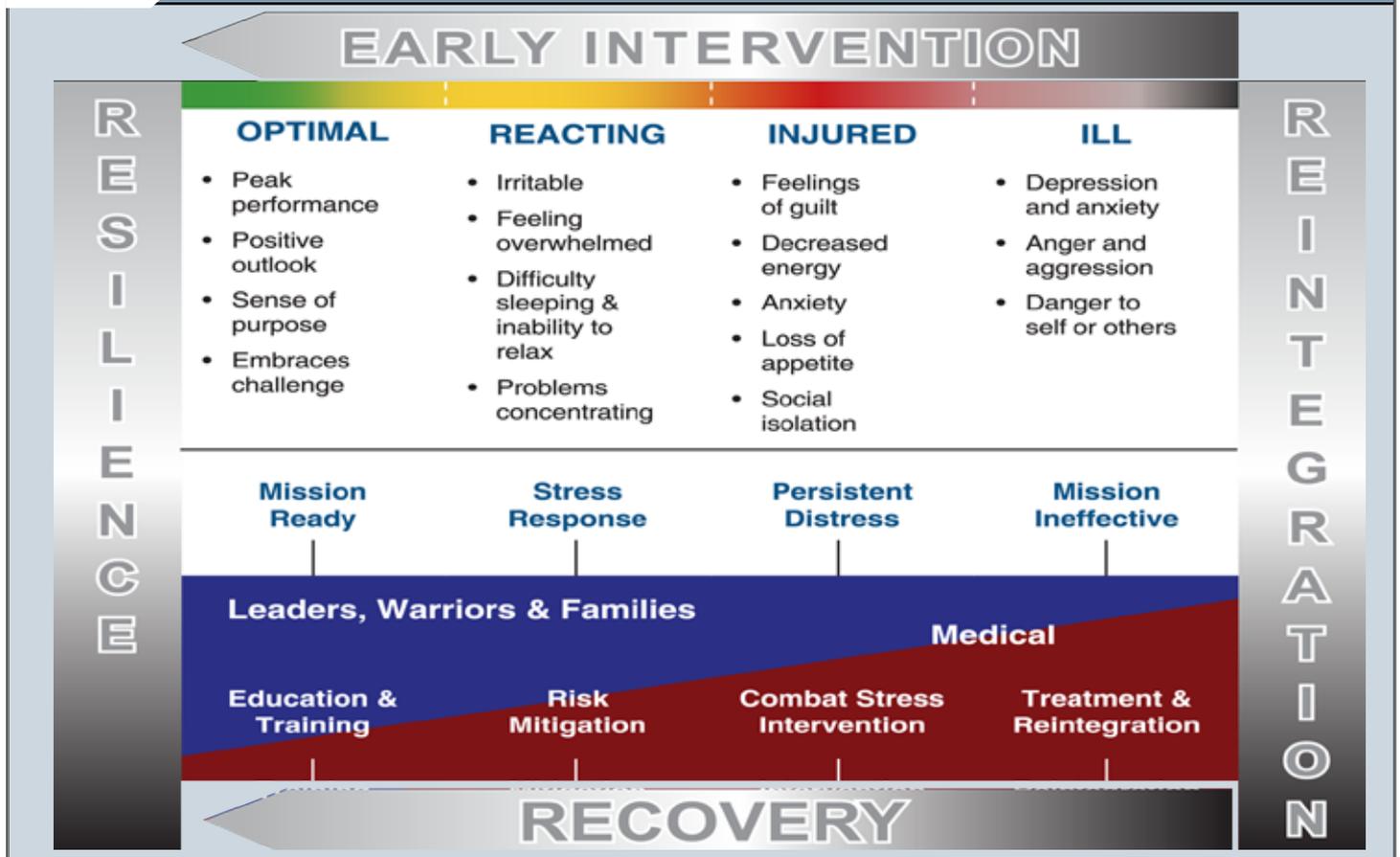
at approximately 10 years post-TBI found that scores on the Positive Changes in Outlook Questionnaire (CiOQ) indicated positive psychological growth and outlook for over half of the sample. They concluded that positive changes are not uncommon in TBI patients, and that injury variables and outcomes at 6 months were poor predictors of positive changes in outlook.

Resilience building can construct health behaviors and, as a result, healthier lives. Developing resilience can have substantial health benefits such as reduced stress and anxiety (Newman, 2005). Having good supportive relationships and maintaining an optimistic view of the world are not often associated with resilience, but tend to help patients be healthier and maybe even live longer (Anderson and Anderson, 2003). Additionally, by understanding what resilience is and its nature, we can foster it and possibly help teach it to others. Those who are resilient and rebound from adversity to their premorbid level of functioning, or at least to a level of functioning that is similar, will prove to be less of a social and financial drain on our system. Those who have overcome severe TBI or trauma can become productive members of society with fulfilling lives. What is interesting is that some people not only come back to a level of functioning that resembles their previous functioning, but may even be stronger and less prone to future problems or stressors (Newman, 2005). Some may even thrive and excel further by improving their ability to handle adversity (Carver, 1998).

As with most chronic or catastrophic injuries, rehabilitation and post-acute care is most effective with a holistic and positive approach (Collicutt McGrath and Linsey, 2006). It has been long known that positive affect and emotional support is vital to the rehabilitation of acquired brain injuries (ABI). Such

TABLE 1

The DCoE Resilience Continuum



treatment for mild TBI has been shown to result in recovery from injuries with fewer complications when a positive expectation of recovery was communicated (McGrath and Adams, 1999). A positive outcome approach with social support has also been shown to be effective with other chronic conditions (Adams, 1996; Collicutt McGrath and Linsey, 2006). In addition, rehabilitation efforts that focus on the strengths of the person, build on what the patient can do, and simultaneously have social and community support, have better outcomes (McGrath, 2004). Rehabilitation psychology has always focused on building resilience by identifying those elements that promote recovery of the patient.

McGrath and Adams (1999) followed a group of patients who had reported high levels of distress on an anxiety scale while in rehabilitation following their acquired brain injury. Once a positive goal-focused rehabilitation program had been implemented, reported distress levels fell and remained low for the patients. This was confirmed with observer ratings. McGrath and Adams' research was an important step in questioning the stereotypes of acquired brain injury patients as incapable of resilience due to the nature of their injury. Furthermore, McGrath and Adams found that many of the patients could be described as self-reliant and had the ability to generate positive coping responses. Also, despite cognitive and emotional information processing problems, those with acquired brain injury seem to maintain a sense of personal stability and coherence as evidenced in a study by Collicutt, McGrath and Linsey (2006) in which they found high scores on Coherence-13 Scale following acquired brain injury.

When it comes to the treatment of brain injuries from the point of injury to years after injury, focusing on the patient and what they want for themselves in the future is the most appropriate approach. Focusing on the past and how current problems arose because of what happened is not as productive as looking at what the patient can do to improve him or herself and invest towards the future. During the rehabilitation stages of recovery, an opportunity exists to perpetuate a positive view and tone in the recovery process. In many cases, the patient knows s/he is limited or has difficulties, but the risk of focusing on the deficits results in patients and caregivers alike becoming complacent in which negativity can ensue, thus affecting motivation and hope (McGrath and Adams, 1999; Siegert et al., 2004).

Benefits of Researching Resilience

Future treatments need to focus on generating interventions that incorporate the current research in this area. Patients may need modified psychotherapy treatments to accommodate the cognitive limitations, yet treatment also should incorporate the positive emotional tone that comes from positive interactions and focus on what the patient's functional progress is. Instilling a sense of resilience through pursuit of meaningful goals also promotes a sense of identity (Dewey, 2002), which can give a person a sense of purpose.

It also has been assumed that people, because of their cognitive limitations, will not benefit from psychotherapy. However, striving with the patient to understand their sense of meaning and learning to manage stress from their environment is empowering. It may be necessary to teach coping skills through the behavioral principles of modeling, that is to say, demonstrating the behavior that you want the patient to exhibit in specific situ-

ations. Furthermore, patients that have memory problems often can and do remember the emotional context of events, yet are at times unable to make the necessary adjustments to respond positively themselves. Unfortunately, brain systems that are important to self regulation of emotions can be disrupted and therefore these behaviors have to be relearned. The point is that the patient does not want to be this way and may need ongoing help with learning to modulate his or her thinking and emotions. Of course, caregivers need to be aware of this so they do not reinforce this behavior. Natural positive consequences of striving to regulate one's behavior is met with its own rewards such as feeling more connections with others, improved interpersonal interactions, and learning how to control impulses that result in a sense of mastery (McGrath, 2001).

Spiritual perspectives can also be helpful especially when injuries that are catastrophic bring to light very existential-type questions. Spiritual orientation can also help with a sense of meaning and constructing purpose (Prigatano, 1989). Certain positive behaviors that are associated with spirituality include a guide or set of rules with which to live life and a philosophy of life to interpret events with purpose and meaning. In others, spirituality is simply a positive behavior and feeling that may influence a patient's perspective and motivation.

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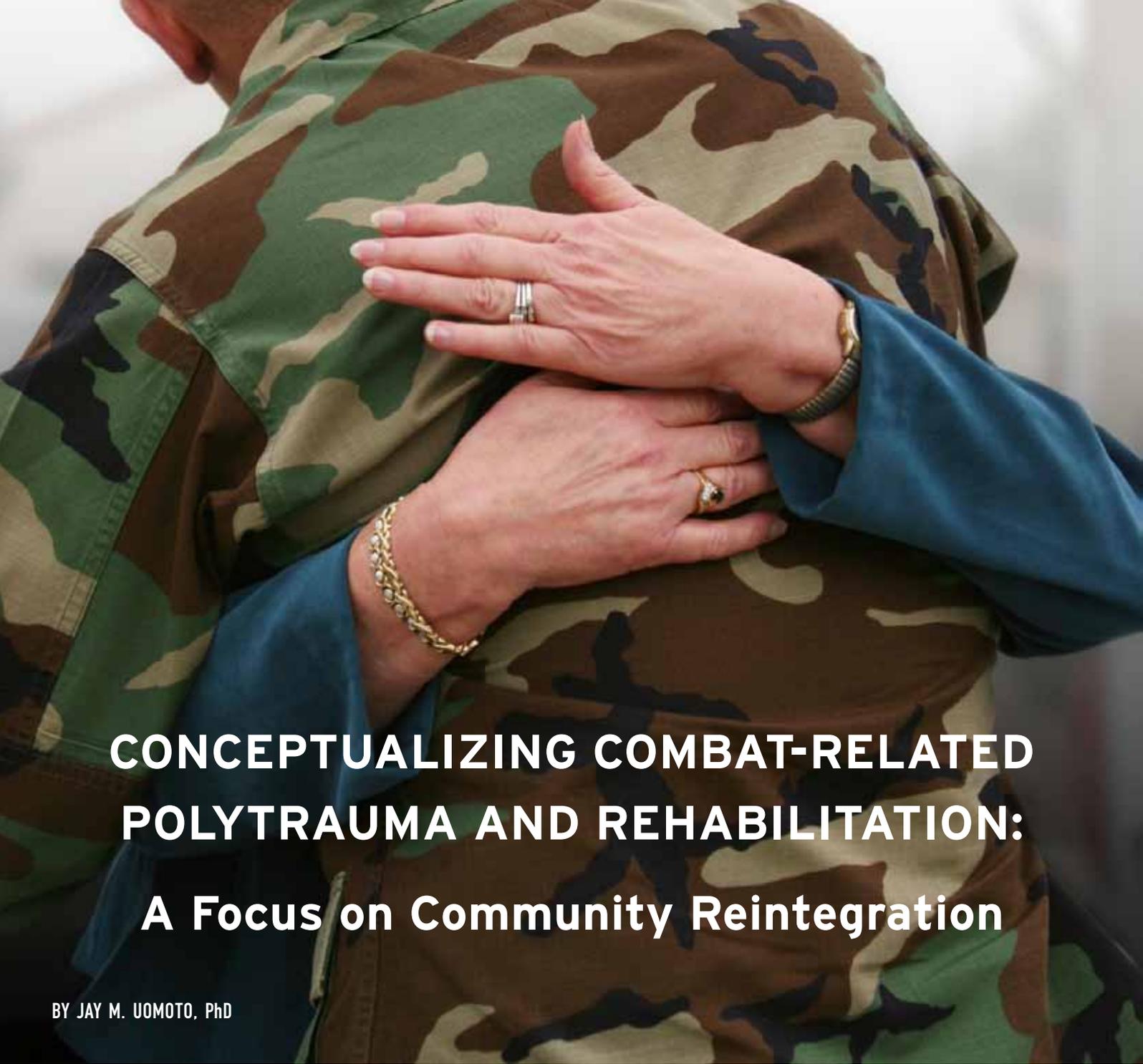
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CONCEPTUALIZING COMBAT-RELATED POLYTRAUMA AND REHABILITATION: A Focus on Community Reintegration

BY JAY M. UOMOTO, PhD

Imagine you are sitting in a large 200-student college classroom, listening to a lecture in a history course at 4:00 in the afternoon. You struggle to take notes at the same time as keeping up with the lecture because of trouble in sustaining attention, all the while experiencing a severe tension headache and low back pain. Your frustration level rises. You are startled by a book that a fellow student accidentally dropped on the floor, and now you are distracted and nervous about how you are going to handle the rush of students in the hallway after the lecture. Imagine something similar to this scenario occurring in other community settings such as in the workplace, at the local grocery store or at the local shopping mall. Imagine these implied problems with attention and memory, chronic pain and post-traumatic stress occurring daily across situations and settings, and this has gone on for more than a year. What is described in the above scenario is a marked disruption in daily life activities

with restricted participation in the community. This is not an uncommon experience of many military personnel and veterans who have served in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF), and who have sustained multiple injuries during their service.

A wide array of complex combat-related injuries and illnesses historically characterize military personnel and veterans of wars in the past, and is true of many returning from OEF and OIF. In one study musculoskeletal extremity injuries accounted for 50 percent of combat wounds in these conflicts (Belmont, Schoenfeld and Goodman, 2010). Such injuries can lead to chronic pain downstream of the initial injury. For example, Girona and colleagues (2006) found approximately 47 percent of OEF/OIF veterans who were enrolled at a Department of Veterans Affairs (VA) Medical Center reported at least a mild level of pain, with more severe pain reported in 28

percent, where back and lower limb pain were most frequent. Combat-related mild traumatic brain injury (TBI) has been the focus of much clinical and research attention, as well as controversy with regard to establishing incidence and prevalence rates (Belanger, Uomoto and Vanderploeg, 2009). Complicating the establishment of such rates among service members and veterans is the co-occurrence of post-traumatic stress disorder (PTSD) and depression. Using electronic medical record data, Carlson and colleagues (2010) found that 48 percent of those that screened positive for possible TBI by the Veterans Health Administration TBI screening instrument carried at least a single psychiatric diagnosis, the most common of which were PTSD and depression at roughly equal rates. These researchers also found that in veterans with a positive screen and who were eventually classified as having a historically confirmed TBI, 85 percent of these individuals had at least one psychiatric diagnosis. Hence, significant overlap of symptoms occurs particularly in those with TBI. Sleep disturbances, cognitive performance decrements in everyday situations, mood changes and fatigue are just a few of those symptoms with multiple etiologies.

One of the more common situations of co-occurring disorders in those injured in OEF/OIF is the overlap of mild TBI with PTSD. The presence of both conditions has been found to be more strongly associated with postconcussion symptom report than with either mild TBI or PTSD alone (Brenner, et al., 2010). The combination of postconcussion symptoms, chronic pain and PTSD have been referred to as the “polytrauma clinical triad” by Lew and colleagues (2009). They examined the records of 340 OEF/OIF veterans enrolled at a Veterans Health Administration Polytrauma Network Site program and found approximately 42 percent of those seen presented with this triad of conditions. Returning to the scenario at the outset of this article, the functional outcomes and everyday life of many service members who have sustained combat-related injuries suffer from a polytrauma clinical triad, often due to the sum of acquired conditions, disorders and injuries sustained during multiple deployments. The scenario reflects what Brenner, Vanderploeg and Terrio (2009) refer to as a “burden of adversity” and characterizes the clinical challenges of post-acute polytrauma rehabilitation.

Combat-related polytrauma rehabilitation consists of more than the treatment of symptoms due to TBI, PTSD, depression and chronic pain. As in the scenario above, at the nexus of these complex co-occurring symptoms is the overarching challenge of community reintegration for returning service members and veterans. It has been this author and co-author’s view (see Uomoto and Williams, 2009; Figure 1 below) that post-combat symptoms follow a “final common pathway” represented by a convergence of combat-related exposures, risks, conditions and injuries. *Exposures* could include that of extreme heat/cold, depleted uranium, burn pit and blast exposures. Increased *risk* for pulmonary conditions secondary to dust storms or increased *risk* for a psychiatric condition may be raised due to multiple psychological stressors. Low back and neck strain secondary to

the wear-and-tear on the body in the war environment can lead to acute and chronic pain *conditions*. A number of *injuries*, both minor and major, can potentially accumulate while deployed in theater (e.g., multiple concussive injuries; tympanic membrane rupture with hearing loss). It is difficult to trace backwards and parse symptoms into specific exposures, risks, conditions or injuries, and assign the relative contribution of each to a service member’s or veteran’s current clinical presentation. However, a focus on the functioning of that person in the community can illumine goals and interventions that lead to improved and sustainable quality of life for that person.

In this conceptualization of polytrauma, the cumulative burden pathway leads to a complex set of symptoms that frequently overlap, resulting in significant restrictions of individual functioning, referred to in the International Classification of Functioning (ICF; World Health Organization, 2001) as “activities,” as well as limiting one’s “participation” or involvement in the community. It is posited here that the focus of polytrauma rehabilitation can benefit by using the framework

Although important to treat symptoms, conditions, and injuries of various sorts, polytrauma rehabilitation is characterized by also focusing treatment goals and interventions toward life skill development, regaining the ability to engage in societal roles, and forming a partnership with the patient and family to formulate goals and sequence of care

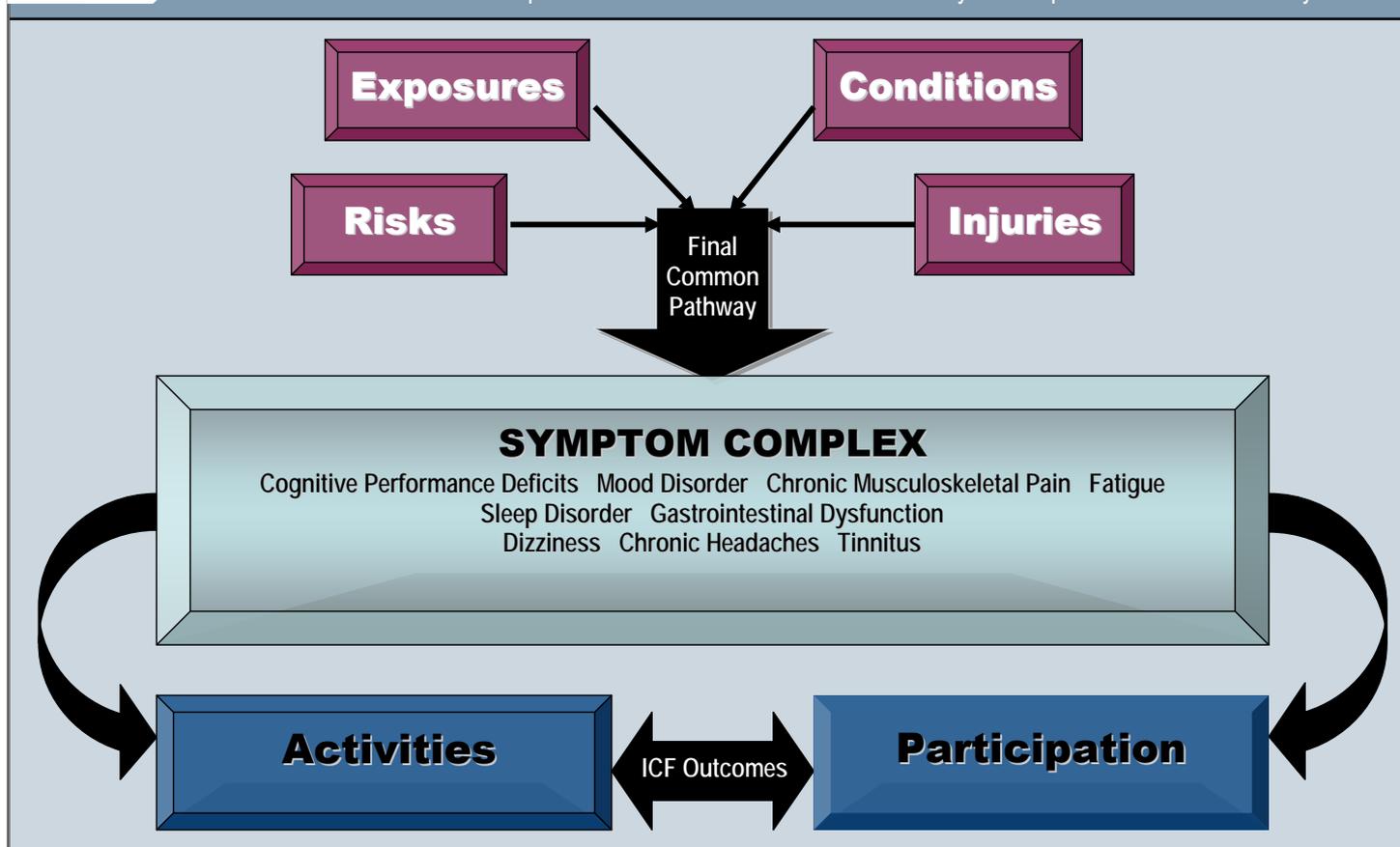
of the ICF to better clarify and set goals for treatment toward community reintegration. Resnik and Allen (2007) used the ICF to specifically describe community reintegration challenges of a group of OEF and OIF veterans. While it is beyond the scope of this article to fully describe their findings, overall veterans with polytrauma injuries (and to a lesser extent, those without such injuries)

presented with a wide range of limitations in community reintegration across the domains of *activities* (e.g., multi-tasking, problem-solving, following conversational rules, safe driving, coping with stressors) and *participation* (e.g., family relationships, job performance, recreational and leisure activities). Although important to treat symptoms, conditions, and injuries of various sorts, polytrauma rehabilitation is characterized by also focusing treatment goals and interventions toward life skill development, regaining the ability to engage in societal roles, and forming a partnership with the patient and family to formulate goals and sequence of care (see Sandberg, Bush and Martin, 2009, who describe a framework for applying the ICF model in polytrauma rehabilitation for Veterans). Placing the ICF model of conceptualizing combat-related polytrauma is likely to ensure that all providers, including those outside of the immediate rehabilitation team (e.g., primary care, behavioral health, college disability student staff) will work truly as an interdisciplinary unit. Here, true interdisciplinary team rehabilitation requires common, clear and attainable community reintegration goals toward which each member of the team works.

One of the mentors to whom I attribute launching my career (as he did for many) was the late Wilbert Fordyce (for a brief obituary from his longtime collaborator, see Loeser, 2010) who can be credited with initiating a paradigm shift in chronic pain management back in the late 1960s to early 1970s. He understood that the experience of pain occurred in the context of the suffering experience evidenced by “suffering behaviors.” In the situation of chronic benign pain, he also felt it impor-

FIGURE 1

Conceptual Model of the Final Common Pathway to Complex Combat-related Polytrauma.



tant to focus on increasing function rather than reducing pain; helping the person “do more” then “hurt less” in that order. In those with combat-related polytrauma, Fordyce’s emphasis upon facilitating the “doing more” (i.e., community reintegration) may also apply and serve as a foundation for setting the end-goal for evidence-based rehabilitation interventions. As he often did with a special knack for tongue-in-cheek wisdom, in one article (Fordyce, 1988) he wrote about two thoughts regarding pain and suffering, the first of which pertained to how pain behaviors are intriguing social communications. His other thought could easily be translated to the situation of polytrauma and suffering:

The second, which I refer to somewhat narcissistically as Fordyce’s law, is nonetheless one that I believe to be of central importance in the world of clinical pain: People who have something better to do don’t suffer as much. (p.282).

Conceptualizing polytrauma rehabilitation as the task of helping the service member or veteran “do something better,” or herein referred to as the goal of community reintegration, is likely to result in much less suffering for that individual, and for those that bear witness to that individual.

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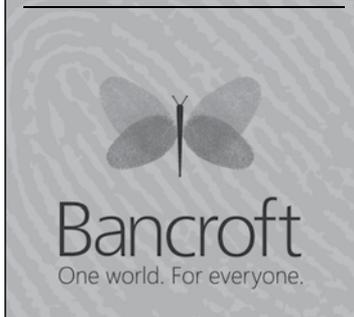
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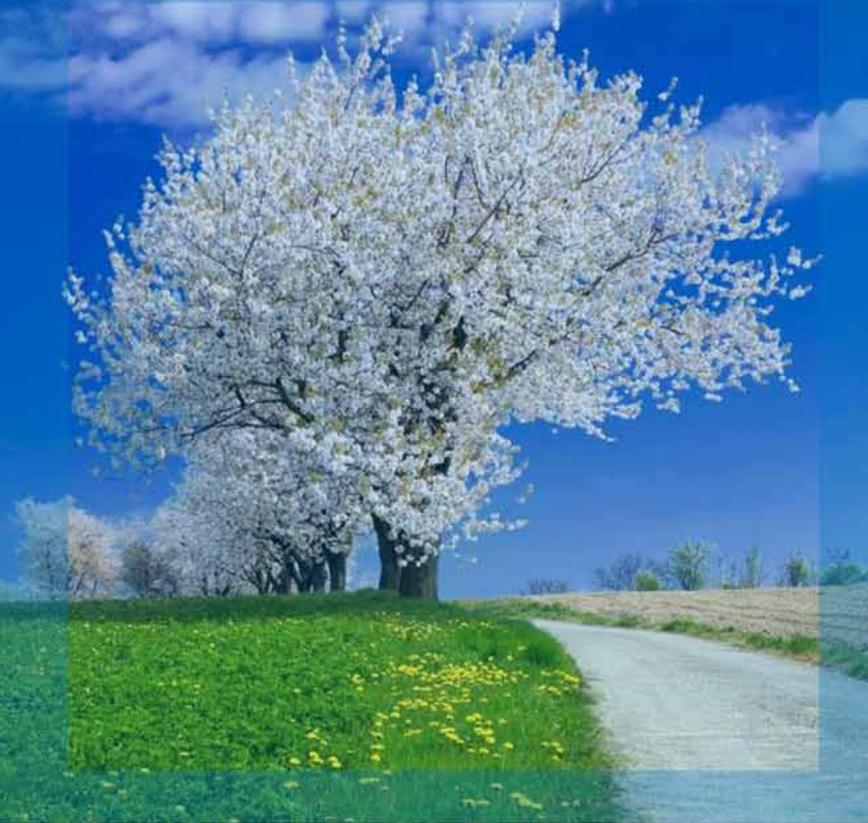
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Welcome

New Guide for Caregivers of Service Members and Veterans

BY MARGARET CAMPBELL-KOTLER, MPH, RN

Overview

Traumatic Brain Injury: A Guide for Caregivers of Service Members and Veterans is designed for families caring for a service member or veteran who sustained a moderate, severe or penetrating traumatic brain injury (TBI) during Operation Enduring Freedom (OEF) or Operation Iraqi Freedom (OIF). The guide has been available online at www.traumaticbraininjury-atoz.org since April 2010 following the receipt of approval for its distribution within the Departments of Defense and Department of Veterans Affairs (VA). Print copies of the guide began to be distributed personally to family caregivers in August 2010.

The guide was mandated by Congress in the 2007 National Defense Authorization Act, which established the TBI Family Caregiver Panel to develop curricula for family caregivers that would provide techniques, strategies and skills to assist in caring for service members and veterans who sustained a TBI. The panel had 15 members: subject matter experts from each of the services, VA, the Department of Health and Human Services, civilian providers and family caregivers. As a federal advisory committee, the TBI Family Caregiver Panel functioned

as a subcommittee of the Defense Health Board. The Defense and Veterans Brain Injury Center (DVBIC) provided programmatic and logistical support for the panel.

Since 2001, 29,558 service members have sustained a moderate, severe or penetrating TBI. A moderate TBI is characterized by a blow or jolt to the head causing loss of consciousness for more than 30 minutes but less than 24 hours; alteration of consciousness lasting 24 hours or less; or post-traumatic amnesia for greater than 24 hours but less than seven days. A severe TBI is characterized by a loss of consciousness of 24 hours or more; alteration of consciousness for more than 24 hours; and post-traumatic amnesia for seven days or more. A penetrating TBI is an open head injury in which the outer layer of the meninges is penetrated.

The course of recovery from a moderate, severe or penetrating TBI may take weeks, months or years. During this time, family and others who provide support to the injured service member play an important role in the recovery process. Rotondi et al report that “When a caregiver experiences lower burden and anxiety and remains healthy, there is a positive effect on the care receiver’s well-being.”¹ A caregiver is defined in the guide

as, “any family or support person(s) relied upon by the service member or veteran with TBI, who assumes primary responsibility for ensuring the needed level of care and overall well-being of that service member or veteran.” Family and caregivers include: spouses, parents, children and other extended family members, as well as significant others and friends.

The goals for *TBI: A Guide for Caregivers of Service Members and Veterans* are, foremost, to provide support to the caregiver, to offer education to family caregivers on TBI and guidance on symptom management and to facilitate communication between caregivers and the members of the health care team.

The guide is comprised of a welcome section and four modules packaged in a loose-leaf binder. A *Caregiver's Companion* of organizational tools is housed in a separate binder. A sturdy backpack is provided for storage and to enable the caregiver to easily carry the guide while his/her hands can remain free to hold a child's hand or to carry additional personal items.

The guide is written in a question and answer format at an eighth grade reading level. Pictures and quotes from family caregivers of service members and veterans who sustained a moderate, severe or penetrating TBI are found throughout. Journaling by the caregiver is encouraged and questions which prompt reflection are included at the end of each chapter.

Development Process

The TBI Family Caregiver Panel held its first official meeting June 17-18, 2008. The panel convened a town hall meeting on June 17 to obtain input from consumers and advocates on the kind of information that family caregivers of service members and veterans with a traumatic brain injury would find useful. The panel heard that families wanted the guide to recognize diversity and include models of families successfully managing their care-giving challenges; the importance of offering hope despite a slow process of recovery was emphasized. Families wanted information on the course of recovery after a TBI, and they wanted to know what to expect and when to advocate for more rehabilitative services. Families expressed the need for information and tools that would enable them to become true partners with the health care team. Families felt that journaling should be encouraged. Families and advocates were quite vocal in their desire for the guide to provide information that would assist families in understanding the military and veterans' health care and benefits systems.

Over the course of the following 18 months, the panel met five times. Between the official meetings, panel members met in workgroups, each focused on a separate module of the guide. Once the content was agreed upon, panel members then moved on to work in functional groups such as editing and design, consumer feedback, marketing and dissemination and website.

Before the guide was finalized, the panel sought the review and input of family caregivers of service members and veterans who had sustained a TBI. Six professionally facilitated focus groups were conducted at DVBC sites in Tampa, San Diego, Fort Bragg and Walter Reed Army Medical Center. One focus group was conducted by telephone. Almost all the focus group participants were spouses who had been a family caregiver from two months to 10 years. The response to the guide was overwhelmingly positive. The caregivers expressed the feeling that the guide highlighted the importance of their role while acknowledging the challenges they faced. Caregivers thought

that the guide provided emotionally supportive content. Focus group participants also reported that they would utilize the guide to discuss the TBI with the injured service member or veteran and use it as a basis for discussion with extended family members. The Panel had considered providing the modules to the caregiver at appropriate intervals in the recovery process. However, the family caregivers wanted *The Guide* to be given to the caregiver in its entirety at one time. It was heartening to learn that focus group participants with as much as ten years of care-giving experience felt they found something new in *The Guide*.

Throughout the development process, the Defense Health Board received five briefings. Its members were kept fully informed of the structure and content of *The Guide*. Defense Health Board members provided invaluable guidance and support to the creation of this tool.

Contents and Key Messages

TBI: A Guide for Caregivers of Service Members and Veterans consists of a Welcome section and four modules.

Welcome Section: The welcome contains an introduction and overview of the guide, as well as suggestions for use of the modules and the *Caregiver's Companion*. The welcome also contains a detailed index of subjects and topics addressed.

Module 1: *Introduction to TBI* provides general information on the structure and function of the brain and how a TBI can affect its function. This module provides definitions to demystify medical terminology, provides helpful diagrams of the brain, discusses the causes and types of TBI, possible complications and the recovery process. This module provides guidance to the family on what they can do to help in the acute treatment phase.

Module 2: *Understanding the Effects of TBI and What You Can Do to Help* consists of more detailed information about the possible physical, cognitive, communication, behavioral and emotional effects that may result from a TBI. This module presents many possible effects but emphasizes the uniqueness of each TBI; each manifests differently with a unique recovery process. The interconnectedness of symptoms is discussed, what the caregiver may see and what the caregiver can do to help. The module provides strategies for helping the service member/veteran to manage his/her challenges and eventual return to duty or life in the community. The module provides a map of Military Treatment Facilities, an introduction to the VA Polytrauma System of Care, introduces the members of the treatment and rehabilitation teams and emphasizes the importance of the caregiver as a member of these teams.

Module 3: *Becoming a Family Caregiver for a Service Member/Veteran with TBI*, focuses on social support and self-care. Real caregivers offer the strategies they employed to find the time to meet their needs for recreation and time to care for their own health problems. Finding meaning in care-giving, taking pride in their ability to care and the growth and change they see in themselves is a theme of this module. Journaling is encouraged as a guidepost to these changes. The suggestions on advocacy for the injured service member/veteran at the bedside, with members of the health care team, with employers and at a policy level were well received by caregivers in the focus groups. Helping children cope when a parent sustains a TBI discusses that the child may feel she/he has lost both parents — one to



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the TBI and the other to care-giving. Age appropriate guidance on discussing TBI with children is included. This module also stresses building on family strengths and offers suggestions for building stronger family ties.

Module 4: *Navigating Services and Benefits* intends to ease the process of obtaining support for the caregiver by providing information on many of the services and benefits available to the service member/veteran and his/her family members. The TBI Continuum of Care is described. Service- and VA-specific information on support services for wounded service members/ veterans and their families is provided. The module offers a self-assessment tool to aid the caregiver to determine the amount of stress that a particular issue is causing on a scale of 1-5. Topics and resources covered in this module include: health benefits, counseling and behavioral health, employment, education, housing, financial issues, legal services, travel, disability evaluation system, transition assistance and state level benefits.

Multimedia Component: The Center of Excellence for Medical Multimedia has agreed to house the guide on its award-winning TBI patient education Web site, Project Journey Home. The guide is posted in PDF form on the Web site and can be downloaded for printing. The video portion portrays three families each with a service member who has sustained a moderate or severe TBI. A skilled facilitator walks the families through the contents of the guide and portrays the questions, anxieties and triumphs experiences by caregivers.

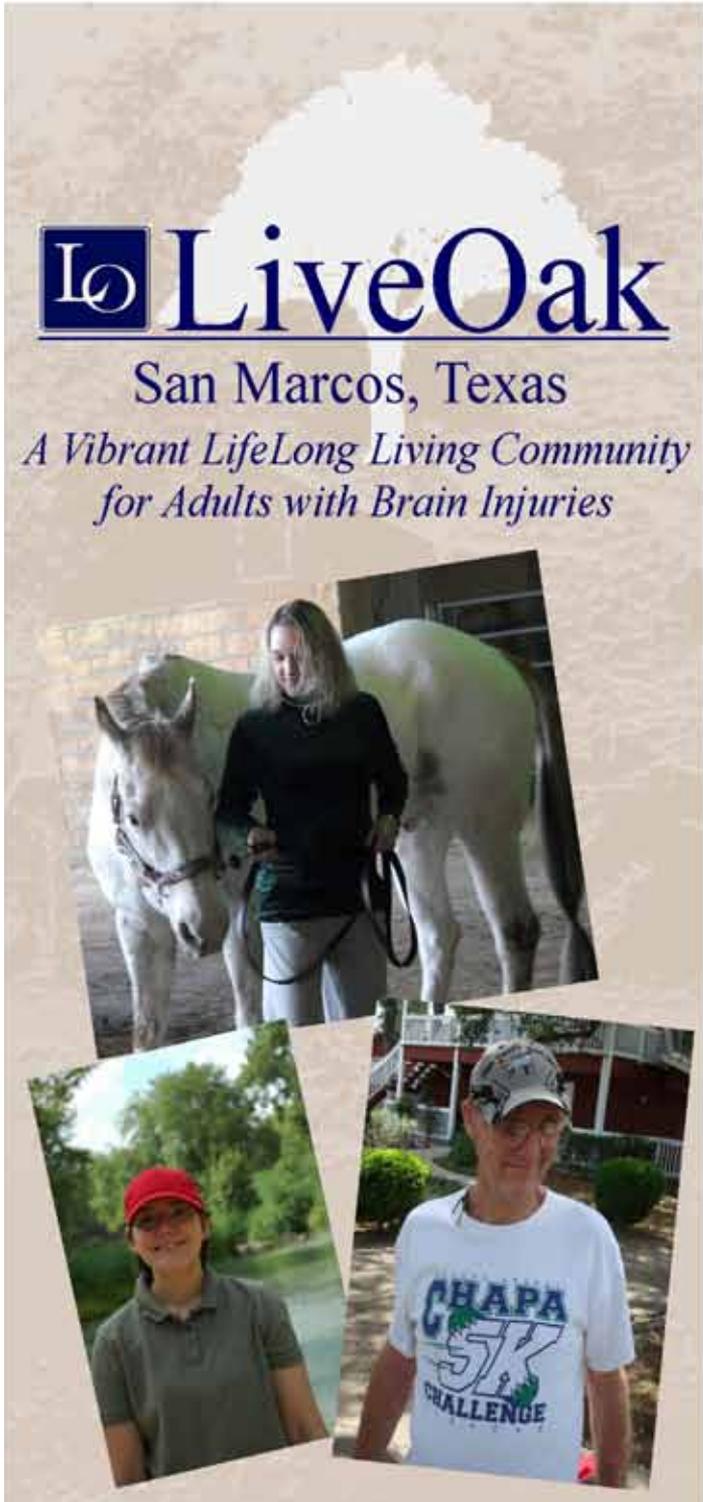
The *Caregiver's Companion* is designed as a portable tool for caregivers to keep with them. It includes a glossary of medical and military terms and a list of military ranks and insignia to help caregivers navigate the new world of military medicine to which they may be unfamiliar. Forms to maintain the names and contact information of all the members of the treatment and rehabilitation team are provided as well as medication logs. A volunteer form with specific tasks such a shopping, meals, etc. will make it easier for extended family and friends to provide tangible assistance. The *Caregiver's Companion* provides a place to store business cards and imaging CDs.

ABOUT THE AUTHOR

Margaret Campbell-Kotler is the Manager of the Office of Education for the Defense and Veterans Brain Injury Center (DVBIC), the primary TBI operational component of DCoE. In this capacity, she managed the development of the Congressionally mandated TBI Family Caregiver Curriculum. In addition, Campbell-Kotler has programmatic responsibility for 13 DVBIC regional education coordinators located at military teaching facilities, VA Polytrauma Centers and two civilian locations across the country. She is responsible for the development and distribution of educational materials on TBI for families, service members and health care providers. Under her leadership, this office distributed over 150,000 TBI educational products in 2009. The DVBIC Annual TBI Military Training Conference attended by over 800 military and veterans' health care providers is organized under her leadership. Prior to joining DVBIC in March 2008, Campbell-Kotler was a member of the senior leadership team of Aging and Disability Services of Montgomery County, Md. and the Executive Director of its Commission on Aging. Campbell-Kotler holds a BSN cum laude, from Niagara University, and an MPH from the University of North Carolina at Chapel Hill.

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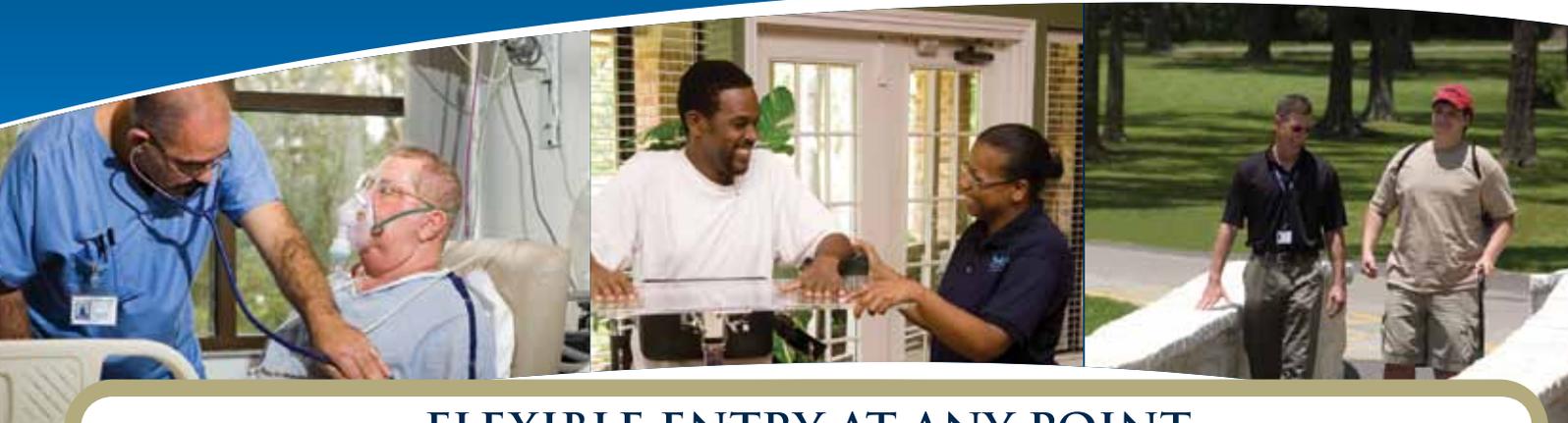


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VIRTUAL REALITY ASSESSMENT OF COGNITIVE FUNCTIONS: A PROMISING TOOL TO IMPROVE ECOLOGICAL VALIDITY

BY GREG M. REGER, PhD, THOMAS D. PARSONS, PhD, GREGORY A. GAHM, PhD, ALBERT "SKIP" RIZZO

INTRODUCTION

Military service in Iraq and Afghanistan comes with the risk of exposure to improvised explosive devices (IEDs), vehicle borne IEDs, rockets, mortars and other blasts. Vehicle roll-over accidents, small arms fire and other non-battle injuries also occur. Accordingly, service members deployed in support of Operation Iraqi Freedom and Operation Enduring Freedom are at increased risk of traumatic brain injuries (TBIs). Since 2000, over 169,000 service members have been diagnosed with a TBI¹ (Department of Defense, 2010) and the RAND Corporation reported that nearly one in five service members who deployed to Iraq or Afghanistan reported a probable TBI (Tanielian and Jaycox, 2008).²

Although mild TBIs, or concussions, typically result in full recovery following a brief period of time, more serious injuries can result in new symptoms or changes in functioning and behavior. Some of these changes occur in cognitive domains such as attention, memory, executive functions, language, spatial abilities and psychomotor skills. These changes are usually documented with paper and pencil tests that compare the service member's cognitive performance to that of their peers. For the comparison to be valid, these tests must be administered in a similar manner to that used to determine the norms — typically quiet, well-controlled environments that minimize distractions and maximize best effort. Cognitive tests can serve a number of clinical purposes including accurate diagnosis, informing the level of care a patient requires, treatment planning and treatment evaluation (Lezak, et al., 2004).³ Repeated assessments can also characterize the nature of the injury and document any changes over time.

Providers in both civilian and military contexts have increasingly been asked to use neuropsychological test performances to make recommendations about patients' everyday functioning (Lynch, 2008).⁴ In the civilian sector, these questions may relate to driving or activities of daily living, whereas clinicians working in the deployed environment or at military treatment facilities may use cognitive assessments to inform questions related to fitness for duty. For example, deployed commanders may have referral questions related to

the safety of personnel to perform basic tactical skills. On the home front, military neuropsychologists may be consulted as part of a "fitness for duty" evaluation that is conducted when impairments significantly interfere with work performance. In addition, there is increasing interest in the assessment of the severity of functional impairment following TBI.

The complexity and lethality of modern warfare place great demands on a service member's neurocognitive resources. At varying levels of threat, service members must be able to exercise control of cognitive functions. It may be challenging to interpret the results of traditional cognitive assessment tools to answer military specific questions. With tremendous individual variability in responses to stress, how well does performance during a well-controlled cognitive assessment predict performance during the stresses of war? It is not known, for example, how well a service member with low average mental efficiency or processing speed following a TBI will react to fire during a tactical convoy. Is this individual fit for combat duty? What kind of performance is required on cognitive tests for a service member to be judged fit to man an automatic weapon during a convoy? Following a mild TBI, how do we assess the functional impairment of service members whose occupational environment has significant, unpredictable low and high intensity stress? Hence, for a measure to be relevant to an assessment of service member neurocognitive functioning, it should provide some indication of a service member's cognitive performance within high and low threat settings.

Questions such as these relate to concerns about tests' ecological validity — the degree to which performance on cognitive tests accurately predict future behavior in the real world. Although some tests have demonstrated evidence of ecological validity⁵ (Strauss, et al., 2006), developments in the area of virtual reality may offer new opportunities to improve ecological validity and inform key questions related to the post-TBI assessment of service members.

VIRTUAL REALITY ASSESSMENT

Virtual reality leverages computers, immersive visual displays, naturalistic navigation devices, and a range of other

peripherals to provide the user with the sense of participating in a 3D computer-generated environment. Virtual environments allow systematic presentation of stimuli as well as recording and quantification of user behavior. The possibility of incorporating visual, auditory, olfactory and haptic stimuli may be very well suited to improving the ecological validity of cognitive assessments. Virtual environments can be created to reflect a wide range of job relevant contexts and can be built to precisely test performances that are related to occupational demands. Tasks with specific relevance to military duties in a deployed setting can be created with emphasis upon the particular cognitive demands of deployed personnel.

VIRTUAL REALITY COGNITIVE PERFORMANCE ASSESSMENT TEST

The University of Southern California's Institute for Creative Technologies (ICT) has developed an adaptive virtual environment for assessment and rehabilitation of neurocognitive and affective functioning. The first iteration of the adaptive virtual environment is a Virtual Reality Cognitive Performance Assessment Test (VRCPAT 1.0) that includes a battery of neuropsychological measures (e.g., attention, spatial abilities, memory, executive functions and higher-level language and reasoning abilities) for diagnostic assessment of service members with neurocognitive deficits. The National Center for Telehealth and Technology and ICT are collaborating on an initial pilot study to validate the VRCPAT 1.0's cognitive assessment tests with active duty military personnel.

The VRCPAT Memory Module requires the user to learn 10 verbal pieces of information (e.g., blue vehicle with bullet holes in the windshield, intact barrel with a U.S. Army label) without any instruction on how this information will be used. The user then dons a head-mounted display, which essentially is a headset with a screen for each eye. This device includes head orientation tracking such that movements in the real world are replicated in the virtual environment and users navigate by manipulating a gaming joystick. A Middle Eastern city environment is presented and the user is instructed to follow a virtual sergeant who will guide them to a series of zones where two of the previously learned targets are incorporated into the environment. The user is instructed to find and photograph the items in each of the five zones. While virtually ambulating to each zone, the user is presented a virtual reality paced auditory serial attention test that is a virtual reality variation of the traditional paced auditory serial addition task (Diehr, et al., 1998).⁶ The virtual reality paced auditory serial attention test involves auditory presentation of numbers (1 through 9) in a randomized format. Subjects are instructed to attend and respond with the sum of the number just presented and the number presented immediately prior to that, all the while attending to the next incoming number of the auditory series. Background ambient noise is present during this task (e.g., idle of a military vehicle, conversations). After photographing as many of the items as they can recall and locate, the user removes the head-mounted display and is asked to recall the whole list of 10 items.

Another virtual environment was developed to test the impact of simulated combat stressors on attention and executive functions. The virtual Humvee stroop test involves the presentation of the color-word interference test stimuli⁷ (Delis, et al, 2001), superimposed on the virtual windshield

of a Humvee. Specifically, users are asked to respond as quickly and accurately as they can and identify the color of red, green, or blue stimuli that appear on the windshield. The second trial asks the user to read words ("red," "green" or "blue") that appear on the screen. The third task is the color-word interference test that requires identification of the color of the font that the stimuli are presented in, ignoring the word. Performance on this task is systematically assessed during a simulated convoy with stretches of the road that include low threat contexts with no combat stimuli and higher threat contexts that include computer-generated IEDs, smoke, small arms fire, enemy combatants directing fire at the vehicle, etc.

A third virtual environment involves a simulated vehicle check point in a Middle Eastern context. The user is dismounted at the checkpoint and receives a "newbee" whose performance the user is judging. The computer-controlled virtual service member proceeds to classify incoming vehicles as either U.S. military, Iraqi police, Iraqi civilian or possible insurgent. After classification, the user determines whether or not the response is correct. In between vehicle presentations, the user is exposed to the virtual reality paced visual serial addition test, in which number presentation is visual instead of auditory. As in the virtual reality paced auditory serial attention test, the virtual reality paced visual serial addition test requires the participant to add pairs of numbers so that each number is added to the one immediately preceding it; however, numbers are presented on a head-mounted display screen (white numbers with an Iraqi checkpoint background) (Fos, et al., 2007).⁸

DISCUSSION

Cognitive tests have historically been used to characterize the nature and severity of the injury, inform diagnosis or assist in localization. With increasing interest in predicting future cognitive functioning in day-to-day living, the ecological validity of cognitive tests deserves increased attention. This may be particularly relevant to the common fitness for duty questions that present in military contexts. To assist commanders in determining fitness for duty, the task may not be to determine the patient's best performance on paper and pencil tests administered under ideal circumstances in a calm and supportive testing environment. Instead, tests that actually resemble the cognitive demands of the operational environment may be needed.

One approach to improving ecological validity is developing new tests that intentionally seek to approximate real world requirements (Chaytor and Schmitter-Edgecombe, 2003).⁹ Whereas it is fairly straightforward to develop ecologically valid tests for typical daily requirements such as facial recognition and map reading, it may be less obvious how to assess the cognitive tasks associated with operational environments. The characteristics of virtual reality may be particularly well-suited to meet this need. Virtual environments can be created with characteristics that are difficult or impossible to create in real assessment contexts. Multi-sensory presentations can improve the fidelity of the testing environment and these environments can be delivered in a controlled fashion with powerful behavior recording capabilities.

Future directions for this work include using the information gleaned from a VRCPAT 1.0 assessment to individually

The Humvee Stroop Scenarios. Stroop, Checkpoint and City Walkthrough Memory Module Figures



(a) Color Naming



(b) Word Reading



(c) Interference.



customize the complexity and difficulty of subsequent virtual reality cognitive rehabilitation tasks or to modulate the intensity of virtual reality stimuli during exposure therapy. In fact, the second iteration of this effort is the Virtual Reality for Cognitive Performance and Adaptive Treatment, which is developing an adaptive virtual environment in which data gleaned from the assessment module (VRCPAT 1.0) will be used for refined analysis, management, and rehabilitation of Soldiers who have suffered blast injuries and varying levels of traumatic brain injury.

While the VRCPAT project is in its early stages, it does represent a preliminary effort to utilize virtual reality technology to improve upon the “real life” value of paper and pencil tests in a deployed environment. Although much work remains before a validated virtual reality cognitive test is available to military clinical neuropsychologists, these innovative technologies present a new frontier in cognitive assessment research and present the hope of improved assessment for our nation’s warriors.

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ABOUT THE AUTHORS

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Albert “Skip” Rizzo is a Clinical and Neuro- Psychologist, and Associate Director of the University of Southern California Institute for Creative Technologies. Within this role he directs the Medical Virtual Reality Research Area and is a Research Professor with the USC Dept. of Psychiatry and the School of Gerontology. Skip conducts research on the design, development and evaluation of VR systems targeting the areas of clinical assessment, treatment and rehabilitation.

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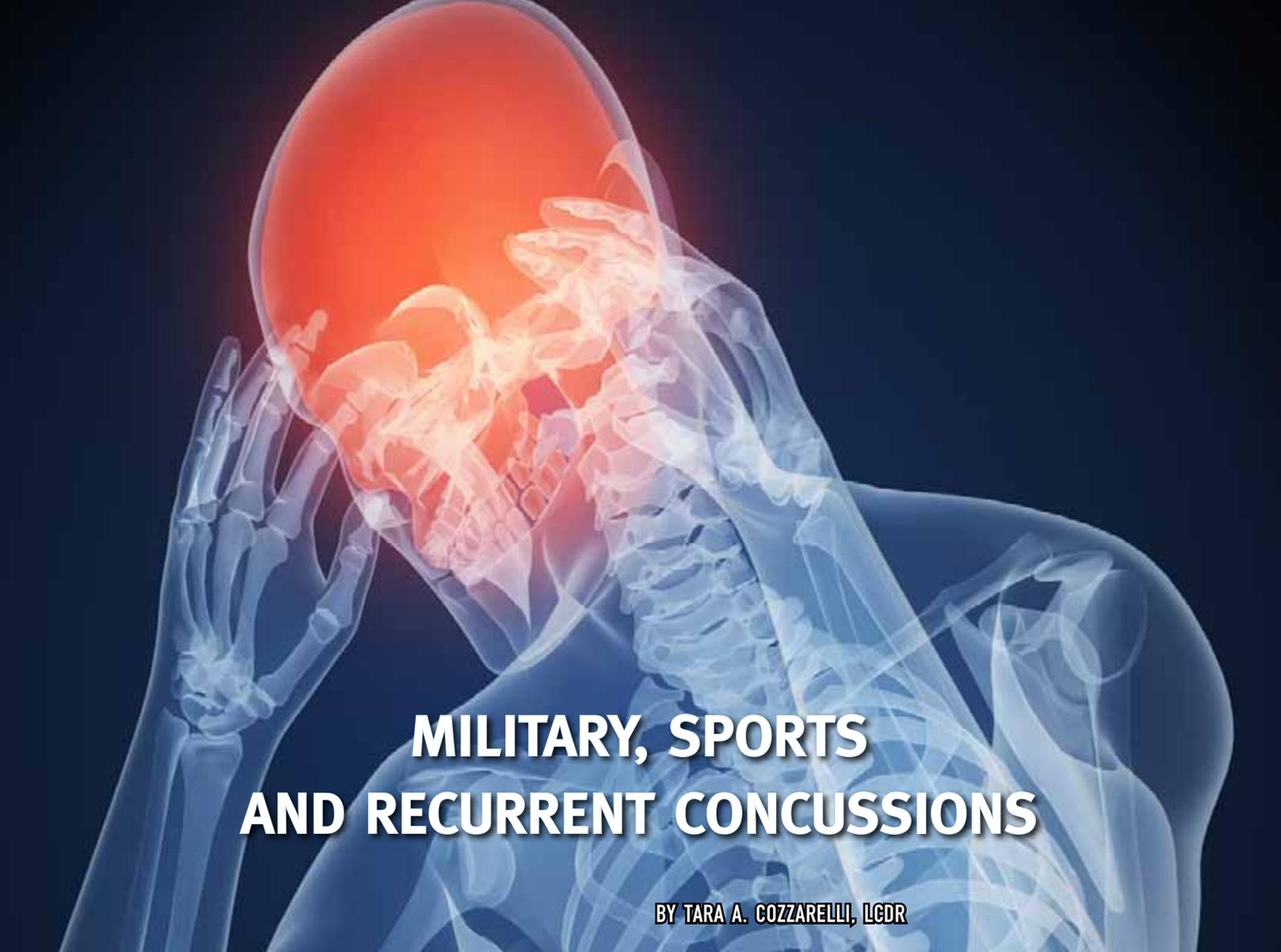
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MILITARY, SPORTS AND RECURRENT CONCUSSIONS

BY TARA A. COZZARELLI, LCDR

Traumatic brain injury (TBI) has been called “the signature injury” of the wars in Iraq and Afghanistan, with more than 169,000 TBIs reported by the Defense and Veterans Brain Injury Center¹. Awareness of and concern regarding combat-related TBIs sustained by the United States military have increased because of the current high use of improvised explosive devices (IEDs) in theater. TBI, however, is not an injury unique to the U.S. military. The Centers for Disease Control and Prevention estimates that 1.7 million Americans sustain a TBI annually². A TBI is the result of a blow or jolt to the head or a penetrating head injury that disrupts the normal function of the brain. Not all blows or jolts to the head result in a TBI. The severity of a TBI is determined by clinical findings at the time of injury rather than expected outcome and may range from “mild” (i.e., a brief change in mental status or consciousness) to “severe” (i.e., an extended period of unconsciousness or amnesia after the injury). The majority of TBIs that occur each year in the U.S., according to the Centers for Disease Control and Prevention, are mild TBIs, also known as concussions². The same is true for TBIs sustained by the military. The leading causes of TBI include falls, motor-vehicle traffic crashes, struck by/against an object and assaults. In the military, the leading cause of TBI is usually a result of an individual’s exposure to a blast, bullets, fragments, motor-vehicle traffic crashes, assaults and sports-related injuries.

Similar to the recent attention given to TBIs sustained by the U.S. military, there has been increased focus on sports-related TBI,

mainly concussion, especially in light of the National Football League’s (NFL) congressional testimony in October 2009. The Centers for Disease Control and Prevention estimates that 300,000 sports-related concussions occur in the U.S. annually³. However, this figure only accounts for those TBIs in which the individual reported a loss of consciousness (Thurman, 1999)⁵. Some studies suggest that TBI with loss of consciousness may only account for 8 percent to 19.2 percent of sports-related concussions (Collins, et al., 2003)⁶. Furthermore, routinely reported U.S. national data may underestimate the true incidence of TBI. Only those individuals treated for TBI in a hospital or emergency room are included, military TBIs are not included and the number of individuals who sustain a TBI but do not seek care is unknown (Langlois, et al., 2006)⁴. Therefore, it is estimated that approximately 1.6-3.8 million sports- and recreation-related concussions may go undetected, untreated and thus, unreported in the U.S. each year.

The effects of multiple concussions have gained recent national interest in the scientific literature, of the mainstream media and of the lawmakers on Capitol Hill. A 2008 University of Michigan Institute for Social Research study commissioned by the NFL and its Player Care Foundation reported that Alzheimer’s-like memory-related diseases appear to have been diagnosed in the league’s former players vastly more often than in the national population — at a rate of 19 times the normal rate for men ages 30 through 49⁷. Studies of National Collegiate Athletic Association athletes suggest that

players reporting three or more concussions are three times more likely to sustain another concussion than players who reported no prior concussion⁸. Furthermore, Dr. Ann McKee, director of the Department of Veterans Affairs VISN1 Neuropathology Center and Brain Bank, among other researchers, has reported on the accumulation of tau protein in athletes with recurrent concussions. Excessive build-up of tau impairs the normal functioning of the brain and can lead to a condition called chronic traumatic encephalopathy, which may manifest as dementia, memory loss or depression. Chronic traumatic encephalopathy has been described in the medical literature for approximately 80 years and was originally referred to as *dementia pugilistica* because of the “punch drunk” presentation of professional boxers. Of particular interest to researchers is if non-impact blasts on the battlefield can cause the same damage as the impact of helmets clashing on the football field and whether or not there are long-term effects.

The military and sports communities have teamed up within the past several years to further understand concussion and its potential long-term effects. At the forefront of the sports initiative is Chris Nowinski, a former Harvard University defensive tackle and World Wrestling Entertainment professional wrestler. The cumulative effect of six concussions ended his World Wrestling Entertainment career and left him with chronic headaches and memory problems. Recognizing the seriousness and dangers associated with concussions and emerging research findings, Nowinski co-founded the Boston-based Sports Legacy Institute with Dr. Robert Cantu. Its mission is to advance the study, treatment and prevention of the effects of brain trauma in athletes and other at-risk groups. Since 2007, multiple professional athletes have come forward and revealed their struggles due to the potential effects of recurrent concussions. The Sports Legacy Institute recently launched the Military Living Donor Registry, a brain and spinal cord donation registry for active duty service members and veterans of the U.S. military. Those who have pledged to donate their neural tissue upon death agree to have medical records and trauma histories reviewed annually prior to death in order for researchers to better understand the effects of military trauma, including blast injuries from IEDs.

Several Department of Defense (DoD) officials currently serve as liaisons to several sports concussion committees to review information and further coordinate as more concussion-related information develops. United States Air Force Colonel Michael S. Jaffee, national director of the Defense and Veterans Brain Injury Center, is the DoD to the NFL Concussion Committee. Dr. Jeffrey T. Barth of the University of Virginia School of Medicine and a senior scientist for the Defense and Veterans Brain Injury Center’s civilian partner Virginia NeuroCare, Inc., has been named to serve on the NFL Players Association Mackey-White TBI Committee, which represents the current and retired NFL players and their concerns for safety and concussion prevention. As a result of these ongoing collaborations and emerging TBI research, the way concussions are treated on the playing field and the battlefield are starting to change. The U.S. military is moving from a symptom-based approach to an incident-based approach. The goal of this new approach is to produce a cultural change within the military regarding potentially concussive events. Identification and treatment as close to the point of injury as possible plus documentation of the incident and expectation of recovery are the foundations for achieving this goal. DoD’s vision is for every service member to be trained to recognize the signs and symptoms of concussion. In the event of an injury, early treatment is necessary to minimize the

impact of the concussion and maximize recovery.

The NFL’s revised concussion guidelines (2009) indicate that a player who sustains a concussion should not return to the game if he shows certain signs or symptoms. Once removed from play, the player should be fully asymptomatic and cleared to return by both his team physician(s) and an independent neurologist⁹. The previous guideline (2007) indicated that a player should not return to the game if he lost consciousness. DoD’s revised guidance for the management of acute concussion in the deployed setting (2010) requires that anyone involved in certain incidents — including all personnel within 50 meters of a blast and anyone who sustains a direct blow to the head or loss of consciousness and those individuals directly referred by their command — be screened for concussion. This new approach will allow for earlier intervention and eliminate the pressure that service members may feel to “shake off” symptoms. The revised clinical guidance also requires anyone who experiences three concussions within a 12-month period to undergo a standard comprehensive assessment prior to returning to duty. This comprehensive assessment includes a neurologic exam, neuro-imaging studies, neurological testing and a functional assessment. Previous guidance required service members to take the initiative to report concussion-related symptoms.

While the goal is to screen service members for TBI as close to the time of injury as possible, this may not occur for a variety of reasons. Therefore, TBI screening occurs in both the deployed and non-deployed settings. The goal is to capture those service members who may have sustained a TBI while deployed and perhaps have symptoms that require further assessment and treatment. Service members who are evacuated from theater for battle or non-battle injuries and illnesses are screened upon arrival to Landstuhl Regional Medical Center in Germany. The main purpose is to identify co-morbid TBI in the context of polytrauma and to ensure proper transportation to an appropriate facility. All service members returning from deployment answer a series of TBI screening questions on the Post-Deployment Health Assessment and Post-Deployment Health Re-Assessment. Finally, any service member who enters the Department of Veterans Affairs for any type of clinical care is screened for TBI with an instrument called the “TBI Clinical Reminder.”

The information about the impact of concussion and, more specifically, recurrent concussions in athletes is an important consideration in informing ongoing military research. A concussion may produce signs and symptoms for some time after the injury, and understanding that mechanism has become a priority for the military. Military researchers are working to understand the long-term consequences, if any, of repeated exposure to blast injuries. TBI researchers and clinicians in the military and sports communities are at the forefront, leading the way for an issue that has become a public health concern as media attention and awareness of concussion have increased. Continued partnerships and collaboration between these two communities will lead to improved concussion guidelines, medical management and understanding of potential long-term sequelae of recurrent concussions.

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AN INTERVIEW WITH DR. JAMES KELLY DIRECTOR OF THE NATIONAL INTREPID CENTER OF EXCELLENCE (NICOE)



How will NICoE improve the quality of care for warriors who have experienced traumatic brain injuries (TBIs) and their families?

NICoE will offer comprehensive assessments and individualized treatment plans for warriors using advanced diagnostic technologies and state-of-the-art treatment methods. Treatments will begin at the NICoE and will be continued in military settings, in Department of Veterans Affairs (VA) Medical Centers and in civilian programs around the nation. A combination of conventional and novel interventions will be provided by an interdisciplinary team of mili-

tary and specialists at the NICoE to warriors whose symptoms have not resolved over time. Family members will be engaged in each stage of the process which will include long-term outcome measures to determine the effectiveness of NICoE's approach and to inform NICoE as to needed adjustments in its approach.

What aspects of the new NICoE facility will enable the organization to better treat TBI?

Besides the advanced technologies available at the NICoE, the process will be coordinated from referral through outcome evaluation by care coordinators who will collaborate with case managers in the military services to maximize the efficient transfer of information, reduce redundancy and enhance satisfaction through NICoE's concierge approach of attending to the individual needs of warriors and their families. This will allow smooth transitions between NICoE and military health care systems around the nation.

NICoE will also have a robust telecommunications system with reach into the military, VA and civilian settings where warriors live and work. This will allow frequent and direct contacts to be sure that every individual's problems are being addressed and their strengths are capitalized upon, leading to improved quality of life.

What do you see as the most pressing TBI-related issues facing warriors, and how will NICoE help them cope with those issues?

We anticipate that those who come to the NICoE will have had a TBI, most commonly a concussion or mild TBI, and will be experiencing ongoing psychological health problems such as anxiety, depression and post-traumatic stress disorder. The pressing issue is that these combined health conditions interfere with the warriors' ability to serve in the military roles and careers, cause interpersonal problems within the family and can lead to the loss of the individual service member's sense of self. It is our intention to work together with the military to address these urgent concerns leading to the warrior's return to productive and gratifying work, to satisfying and lasting relationships with family and friends, and a real sense of contributing to their worlds — the reason so many chose the military lifestyle.

NICoE has forged strong relationships within the Department of Defense (DoD), VA, National Institutes of Health and Uniformed Services

University of the Health Sciences, as well as with private, academic and philanthropic institutions — why are these relationships important?

NICoE was conceived as the "hub" of the component centers of the Defense Centers of Excellence for Psychological Health and TBI, which itself has strong affiliations with VA and other federal institutions. The NICoE research and education missions allow for natural partnerships with the Uniformed Services University of the Health Sciences and National Institutes of Health, which are not only in close proximity, but have guided the steps necessary for NICoE to become a bridge between them and other academic partners around the nation. From the sharing of data sets to providing consultation in the selection of technologies and personnel, the DoD (especially Health Affairs), VA (its Central Office and Polytrauma Centers), Uniformed Services University of the Health Sciences and National Institutes of Health have been assisting in planning how NICoE will serve in its unique role.

Will NICoE use a holistic approach in treating service members who have experienced a TBI?

NICoE will have medical and allied health personnel experienced in "Integrative Medicine" which will combine elements of complementary and alternative medicine with established procedures from Western and Eastern medicine. Yoga and acupuncture will be used alongside conventional medications and physical, occupational and speech therapies. All team interactions will be from a patient-and-family centered approach in which each provider will learn from the others, incorporating knowledge in ways that will cross traditional disciplines to benefit the warrior and family.

A new Fisher House has been constructed adjacent to NICoE for patients' families — what is the role of family support in warriors' recovery from TBI?

One of the three new Fisher Houses under construction now will be dedicated to NICoE, the other two being built to accommodate the expected need for the future integration of Walter Reed Army Medical Center onto what is currently the National Naval Medical Center campus. The 20 warriors and their families at NICoE will be able to stay at the Fisher House where comfortable surroundings will enhance their experience over the two week stay.

What is NICoE's plan for opening and operating satellite facilities going forward?

There is currently no plan for physical "satellites" but rather there will be NICoE Network Sites around the nation at Military Treatment Facilities, civilian treatment programs and links to VA medical centers will be set up through telecommunication technologies. This will allow DoD to leverage existing facilities and personnel, creating synergies among systems for the benefit of our warriors and veterans.

Where do you see NICoE as an organization in five years? Ten years?

NICoE can be expected to have an enduring leadership role in the field of psychological health conditions and TBI, leading to new evidence, the understanding of brain dysfunction, and contributing to advances in the neuroscience of brain-behavior relationships. Observations of patterns elucidated by NICoE's capabilities in neuroimaging, neuropsychological assessment, virtual reality, genetics and proteomics will serve as the foundation of the "neuroscience frontier" for decades to come.

The ballot is stronger than the bullet.
-- Abraham Lincoln



On November 2nd, elections will be held across the country to elect all members of the US House of Representatives, and to elect 37 senators to the US Senate. On the ballot will also be candidates for state representatives, state senators, and in some states, candidates for state-wide office. This year, 37 states and two territories will hold gubernatorial elections. Election years provide good

opportunities to meet with candidates to discuss brain injury issues, and to continue communications through follow-up congratulatory letters to those who win.

Meanwhile, the current Congress returned after the August recess to work on unfinished business, including extending tax relief and the federal budget. As of September, Congress had not passed any appropriation bills for federal agencies for FY 2011, which starts October 1st. The House and Senate are likely to pass a continuing resolution (CR) providing level funding for federal government and programs until at least mid-November when the “lame duck” Congress will return to finalize business before adjourning. There have been discussions whether Congress will pass a year-long CR, which would provide level funding, or will cut the overall funding for discretionary funding programs. Level funding means that the program would receive the same amount as was appropriated for FY 2010.

The Senate defeated an amendment offered for the Small Business Jobs and Prevention Act of 2010 that would have used the \$15 billion prevention and wellness trust fund cre-

ated by the Affordable Care Act (ACA) of 2010 to offset the cost of repealing a 1099 reporting requirement also established by the ACA. In FY 2011, \$750 million of this fund will be used for community transformation grants, chronic disease prevention, epidemiology research, and health and wellness grants to communities, state government, hospitals and other entities to improve the health of Americans. This is one of the first attempts to make changes to the health care reform bill.

On September 8th, the House Committee on Energy and Commerce Subcommittee Health held a public hearing on H.R. 1347, The Concussion Treatment and Care Tools Act (The ConTACT Act) that was introduced by the co-chairs of the Congressional Brain Injury Task Force, Reps. Bill Pascrell, Jr. (D-NJ) and Todd Platts (R-PA). The legislation authorizes grants to states to adopt and disseminate federal concussion management guidelines and provides funding to implement a computerized pre-season baseline and post-injury neuropsychological testing in schools for student athletes.

The US Department of Health and Human Services (HHS) Secretary Sebelius released the National Strategy to Improve Health care Quality on September 10th and is seeking public input in the development of a National Health Care Quality Strategy and Plan. The ACA calls for a national quality strategy plan, as well as the development of a National Prevention and Health Promotion Strategy (the “National Prevention Strategy”) that is scheduled to be released in March of 2011. Both the National Quality Strategy and the National Prevention Strategy seek to generate, align and focus collaboration among public and private sector partners. To view the plan and make recommendations go to <http://www.hhs.gov/news/reports/quality/nhcqsap.html>.

President Obama has created the bipartisan National Commission on Fiscal Responsibility and Reform to propose recommendations to balance the federal budget, excluding interest payments on the debt, by 2015. The Commission is to propose recommendations to improve the long-run fiscal outlook, including changes to address the growth of entitlement spending and the gap between the projected revenues and expenditures of the Federal Government. The Commission will vote on a final report containing a set of recommendations to achieve its mission no later than December 1, 2010. A large coalition of both national and state organizations is urging the Commission and Congress not to consider cuts to Social Security as a way to reduce the federal deficit.

While most people think of retirement benefits, the Social Security Administration also pays disability benefits through two important programs: the Social Security Disability Insurance program (SSDI) and the Supplemental Security Income (SSI) program.

Participating in the election process provides an important way to voice your opinions on overall policies affecting individuals with brain injury. There may be many changes to Congress following the election. A new Congress, regardless of which party is in charge, provides opportunities for all who are interested to educate members about brain injury and the Congressional Brain Injury Task Force.

ABOUT THE EDITOR

Susan L. Vaughn of S.L. Vaughn & Associates, consults with states on service delivery and serves as the Director of Public Policy for the National Association of State Head Injury Administrators. Ms. Vaughn retired from the State of Missouri after nearly 30 years, where she served as the first director of the Missouri Head Injury Advisory Council. She founded NASHIA in 1990, and served as its first president.

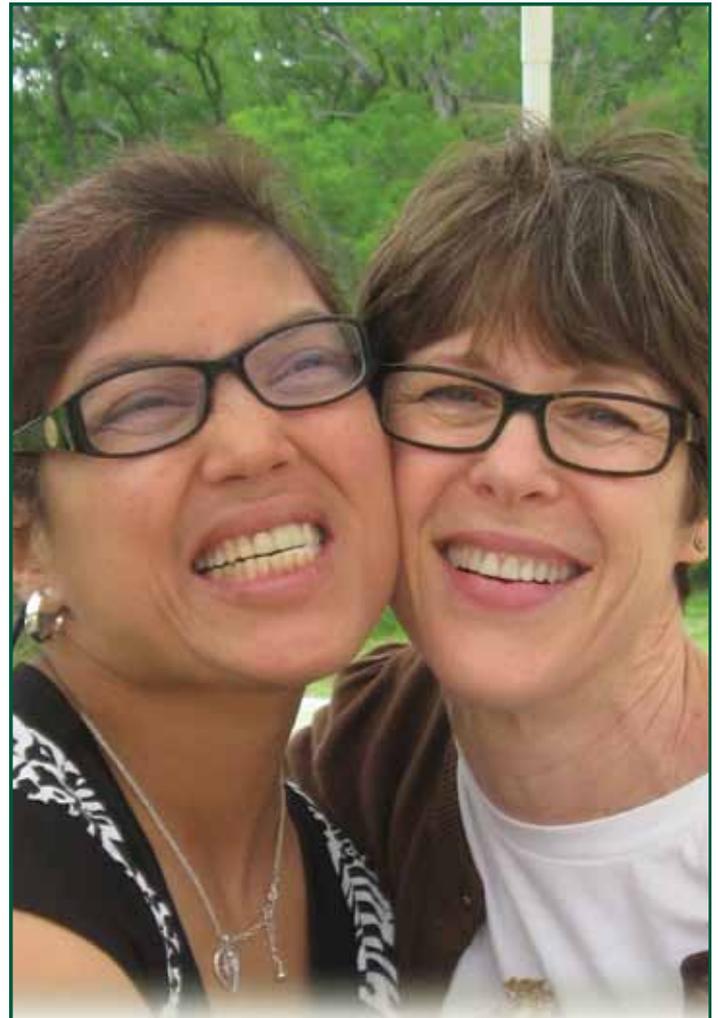


The *inTransition* Program:
Support for service members receiving mental health treatment

Transitions in military service can be challenging. Any transition—be it a call to active duty, relocation or other events—can take its toll. If the Service member is presented with such a transition challenge while in mental health treatment, he or she may need extra resources. Help is now available through the *inTransition* Program.

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For more information please log on to www.health.mil/inTransition.



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NORTH AMERICAN BRAIN INJURY SOCIETY

NABIS is working with the National Association of State Head Injury Administrators to put the final touches on our combined annual meeting entitled *Brain Injury Partnerships: NASHIA & NABIS in the Twin Cities*, which will be held October 5-8, 2010, at the Minneapolis Hilton Hotel. All accepted abstracts will be published in the *Journal of Head Trauma Rehabilitation*. The joint meeting will be held concurrently with the 23rd Annual Conference on Legal Issues in Brain Injury, a three-day event specifically for attorneys involved in brain injury litigation. This conference will feature an all-star cast of top trial attorneys and medical experts who will present a broad array of practical information covering the latest literature, diagnostic testing methods, rehabilitation, case management, trial techniques and cutting-edge demonstrative evidence.

Visit the NABIS website www.nabis.org for more details.

BRAIN INJURY ASSOCIATION OF AMERICA

The threats and opportunities arising from the Affordable Care Act are real! That's why BIAA and its Business & Professional Council continue to aggressively lobby for favorable regulations under the new law. We are addressing issues as diverse as pre-existing conditions, annual and lifetime caps, appeals processes and, in the coming months, coverage mandates for rehabilitation of individuals with brain injury. Anyone whose livelihood depends on the rehab industry has a vested interest in the regulations. If you or your company has not joined BIAA's Business Council, you can do so by visiting www.brain-injurycouncil.org. BIAA has endorsed The Veterans' Traumatic Brain Injury Rehabilitative Services Improvements Act of 2010, which would ensure wounded warriors with TBI receive a comprehensive and holistic rehabilitation plan.

BIAA is also advocating for and providing technical assistance to Capitol Hill staffers on federal legislation and funding to support youth sports concussion/return-to-play at the state level. The 6th Annual Brain Injury Business Practices College is taking place Feb. 22-24, 2011 at The Menger Hotel in San Antonio. Sessions specifically designed for CEOs, COOs, Sales/Marketing Professionals include territory management, cost and risk management, staff development, succession planning, customer service, business ethics and the ever-popular case studies. Watch www.biausa.org for more details on the Business College and other BIAA programs and services for professionals.

INTERNATIONAL BRAIN INJURY ASSOCIATION

The International Brain Injury Association continues to make progress planning the Ninth World Congress on Brain Injury which will be held March 22-25, 2012, in Edinburgh, Scotland. International and local planning committees have been

established, and are comprised of some of the leading experts in brain injury research and rehabilitation. The Congress will be relevant to professionals who work with people with acquired brain injury and will provide a forum for education, formal and informal discussion and debate. As usual, the scientific program will include talks from internationally renowned experts in the field of brain injury, scientific poster and paper presentations, candlelight sessions with experts, as well as, pre- and post-conference symposia (including an optional trip to Glasgow to tour some of the key historical sites from the field of brain injury rehabilitation). Up to date research will be presented on a variety of topics ranging from neurobiology to neurorehabilitation and from the theoretical to the very applied.

The IBIA awards will be presented, including the Jennett & Plum Award for Clinical Achievement in the Field of Brain Injury Medicine, the Henry Stonnington Award for best review article in *Brain Injury*, the IBIA Young Investigator Award and the Car of the Year Award. We will have a host of exhibitors to complement more formal aspects of the conference and to encourage collegial networking. Edinburgh, the capital of Scotland, is a picturesque historic city, dominated by its famous castle with many fine hotels, restaurants, museums and traditional pubs! There is easy access to Glasgow, the Highlands and to tourist and sporting opportunities. A number of social events will be organized that will give opportunities to explore the depth and breadth of Scottish culture and the beautiful scenery of Scotland. Please visit www.internationalbrain.org for more details as they become available.

NATIONAL ASSOCIATION OF STATE HEAD INJURY ADMINISTRATORS

Since our last update, NASHIA and the North American Brain Injury Society (NABIS) have focused their resources in planning and preparing for our joint October conference. This is a significant event for NASHIA as it is the unique opportunity for us to again connect with our members and colleagues from across the country and territories. A time to hear directly their concerns, celebrate in their accomplishments, report on our last year and plan for the future.

Additional activities will include election of a new slate of officers and Board of Directors. This is also an opportunity for the NASHIA Public Policy Committee, with Susan Vaughn, Director of Public Policy, to present for approval from its membership, NASHIA's proposed legislative priorities for the upcoming 2011 Congressional session!

Certainly NASHIA continues to hear of the deep and discouraging financial challenges being expressed and experienced across our country! However, states are resourceful and creative and are also finding ways to weather the storm and continue their mission of supports and services for individuals and their families. Remember to check out our website at www.nashia.org.



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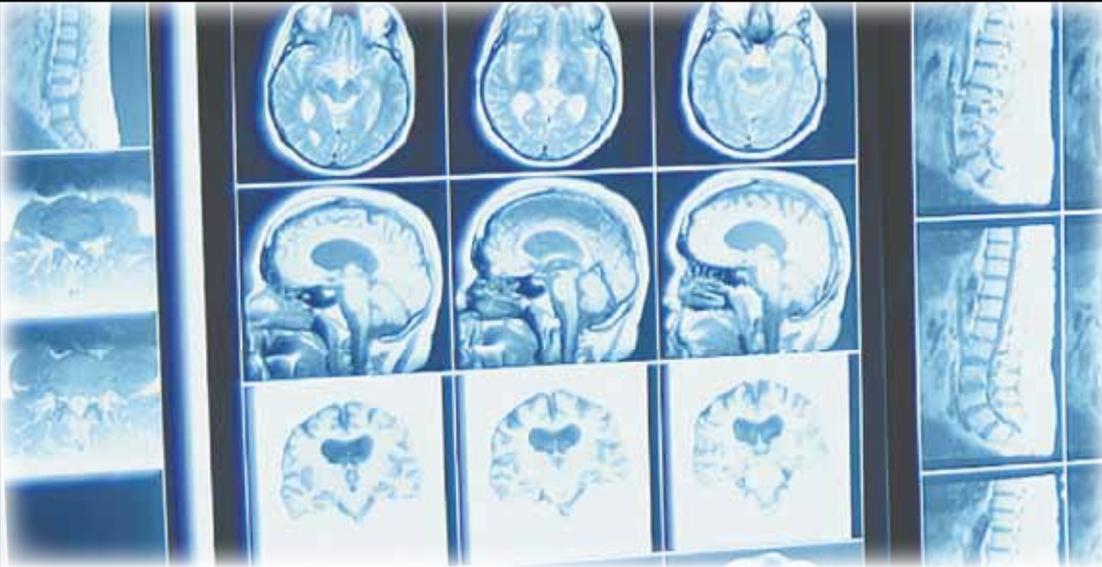
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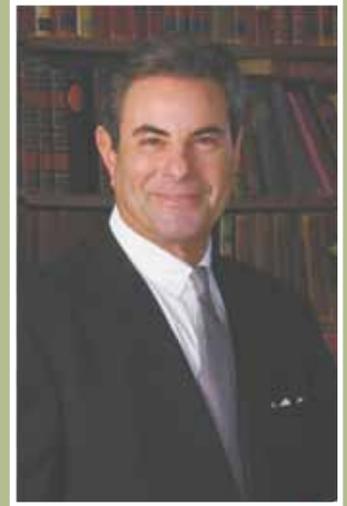
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