**Development and Evolution of a Comprehensive Mild Traumatic Brain Injury (mTBI) Inpatient Rehabilitation Program: A Nursing Perspective**

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**Abstract**

The James A. Haley Veterans’ Hospital in Tampa, Florida has developed an innovative approach to the unique rehabilitation needs of active duty Special OperationsForces, and Veterans with chronic conditions related to their military service. Tampa’s program, the Post-Deployment Rehabilitation and Evaluation Program (PREP), was established in 2008. The interdisciplinary team includes 1 nurse practitioner and 8 staff registered nurses.  The Veterans Health Administration is using Tampa’s established and successful PREP as a model to actively expand the program to other VA Polytrauma Rehabilitation Centers over the next several years. There are important nursing and rehabilitation team considerations necessary for the successful development of these unique comprehensive mild traumatic brain injury (mTBI) rehabilitation program for inpatients.

***Keywords:*** Polytrauma; Multiple trauma; Cognition disorders; Traumatic brain injuries; Veterans Health Services; Military medicine; Nursing care

**Development and Evolution of a Comprehensive Mild Traumatic Brain Injury (mTBI) Inpatient Rehabilitation Program: A Nursing Perspective**

In 2008 the James A. Haley Veterans’ Hospital in Tampa, Florida instituted a novel approach to inpatient rehabilitation for Special Operations Forces, and Veterans suffering from mild traumatic brain injury (mTBI). Known as PREP, the Post-Deployment Rehabilitation and Evaluation Program has proved to be successful in improving patients’ physical and mental health status. Because of the program’s success and a request from the Special Operations Command (SOCOM), a decision was made to expand the program. In January 2020, a meeting was held to plan, develop, and expand national programs such Tampa’s PREP to the other four polytrauma rehabilitation centers within the VA’s Polytrauma System of Care.1

Leadership from the VA’s 5 Polytrauma Centers (Minneapolis, MN; Palo Alto, CA; Richmond, VA; San Antonio, TX; and Tampa, FL) met in Tampa with the PREP rehabilitation subject matter experts to discuss expansion of the PREP therapeutic model. Following the meeting, discipline-specific work groups met to continue expansion plans and disseminate best practices. This paper aims to share the importance of rehabilitation nursing practice considerations in developing a comprehensive individualized rehabilitation community reintegration (IRCR) treatment program.

**History**

The Global War on Terror (GWOT), Operation Enduring Freedom (OEF) (2001-2014), and Operation Iraqi Freedom (OIF) (2003-2011) led to an increased need for specialized medical, surgical, and rehabilitative services for both the Veterans Health Administration (VHA) and the Defense Health Agency/Department of Defense (DHA).  In 2005, the VA established the Polytrauma System of Care (PSC), an integrated national network of specialized rehabilitation programs dedicated to combat and non-combat related traumatic brain injury (TBI) and polytrauma for both active duty service members and Veterans.2

Utilizing an interdisciplinary team model with an IRCR treatment plan, the PSC developed and implemented advanced inpatient rehabilitation interventions. Inpatient polytrauma teams soon recognized a cohort of patients with similar and complex symptomology: persistent pain, headache, poor sleep, cognitive challenges, and mental health sequelae (e.g., anger, irritability, PTSD, social/work interaction difficulties). Frequently “hidden,” these symptoms were often unmanaged, chronic in nature, and difficult to address in traditional inpatient acute rehabilitation programs.3

The Tampa VAMC opened its PREP program in 2008 to address the needs of this population and their suffering from chronic sequelae related to mild traumatic brain injury (mTBI). PREP began with six inpatient rehabilitation beds for a 3-week program of comprehensive symptom assessment, evaluations, and recommendations. Following completion of the program, patients were discharged to return to their designated military treatment facilities (MTF) or VA medical facilities with detailed plans for follow-up treatment and care.

There has been extensive research on mTBI treatments since the early years of the Global War on Terror (GWOT). As described earlier, mTBI injured service members or Veterans may, without specialized rehabilitation, experience multiple acute or even chronic symptomologies taht may lead to the development of difficulties in performing daily activities of living in both their professional and personal lives. . MacGregor et al. suggested that the “combination of comorbid concussion, psychological disorders, and musculoskeletal pain” may contribute to “greater real or perceived functional limitations relative to other symptom clusters.”3

This cohort includes a number of Special Operations personnel whose duties and responsibilities require the combination of focused attention, physical strength/stamina, emotional stability, and behavioral resilence in the execution of their assigned missions in extremely high stress situations.. In writing about the effects of stress in Navy SEALS training, Smith et al. explained, “stress-is-enhancing mindsets are relevant and impactful in extreme evaluative settings.”4 This cohort has a unique tempo which energizes their work and may lead them to ignore individual health challenges.

PREP was soon recognized as the rehabilitation program of choice for active duty and Veteran service member patients recovering from persistent symptoms related to blast and combat related injuries (inclusive of blast related hearing and vision deficits).. . Blast injury effects go beyond the physical to include psychological problems such as post-traumatic stress disorder (PTSD) and depression.3 With consideration of the motor, sensory, cognitive, psychosocial, and behavioral sequelae, the guidance of one interdisciplinary team was determined a benefit for the patient by providing an individualized care plan and committed ongoing follow-up continuity to optimize recovery.

Referral sources for PREP vary and include facilities that treat Veterans or active duty service members in both national and international locations. Referral agencies include the Special Operation Forces (SOF), Special Operations Command (SOC), Warrior Care Coalition (U.S. Army), Warrior Transition Units, Air Force, Coast Guard, Marines, Marine Special Operations Command (MARSOC), SEAL teams (U.S. Navy), and the Special Warfare Combatant-Craft Crewman (SWCIC).

**Demographics**

PREP demographics at the Tampa VA facility have been consistent for the most recent three years, FY2017-FY2019. (See Table 3.) Although Veteran admissions have remained small in comparison to active duty admissions, they have been increasing steadily. There has also been an upward trend in length of stay and average number of therapy hours per day.

**Table 1.0. PREP demographics Tampa VAMC, FY2017-FY2019.**

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**PREP Evolution**

GWOT conflicts introduced a variety of new types of combat injury and recovery for those with mTBI.5  The PREP team continued to learn more about mTBI symptomology and sequalae resulting from patients’ ongoing and multiple military deployments. Mental health related diagnoses were frequently noted during assessments, and tailored interventions were implemented for advanced and robust care plans. Treatments included PTSD therapy, intensive vestibular therapy, cognitive therapy, and sleep hygiene management.

 In 2013 the program was augmented with an optional 8-week treatment program. This permitted more focused intensive inpatient treatment modalities. This longer treatment period without the distractions of military duties or full-time employment provided an optimal environment for recovery. The PREP program received its first Commission on the Accreditation of Rehabilitation Facilities (CARF) certification in 2013. Having this distinction from an international accrediting body further ensures that quality and performance improvement measures are identified while meeting the unique needs of the service members and Veterans for best achievable outcomes.6

  In late 2019, SOCOM engaged with senior VA PSC leadership to consider expansion of the PREP concept to VA facilities in other geographic regions. SOCOM’s recommendation to expand the PREP program was a result of its successful patient outcomes (Table 2.0) and positive patient satisfaction ratings (Table 3.0). The data presented in the tables is derived from surveys completed by patients at three separate time intervals including admission, discharge, and three months post-discharge. The survey packet contained multiple screening and assessment tools. Patients received a three-part tool developed by the Tampa VA for assessment of program satisfaction, knowledge and understanding of treatment, and a neurobehavioral symptom inventory measured by Likert scale. In addition, the survey packet included the PHQ-9, PCL-5, Satisfaction with Life Scale, HIT-6, Epworth Sleepiness Scale, GAD-7, Vestibular Specific Dizziness Questionnaire, Activities-Specific Balance Confidence Scale (ABC scale), Audit C, and the Mayo-Portland Adaptability Inventory-4 Participation Index (M2PI) for goal attainment and sustainment assessment. The data was compiled from participants’ responses in the three- and eight-week programs. On completion of PREP, patients reported decreased mTBI symptoms and improved functions (Table 2.0). The PREP experience also achieved high patient satisfaction scores (Table 3.0). As a result of these successes, demand for PREP services supported an increase in bed capacity. Bed count was increased from 6 to 9 beds in 2017 and to 12 beds in 2019.

**Table 2.0.** PREP Patient discharge survey results FY2019

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**Table 3.0.** PREP Patient satisfaction survey results, FY2017-FY2019

Chart, bar chart

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**Unique Patient Population Needs**

 There are unique nursing considerations when caring for patients with mTBI and military special forces training. A strong nurse-patient relationship is vital. Special Operation Force (SOF) service members are highly trained to profile, verify, and substantiate trust - both with unit members and with the public. Hospital staff must be aware that patients may review their social media platforms to evaluate publicly available information and compare that with the verbal and non-verbal body language patients observe on the unit. Strong interpersonal relationships are key to these service members because any potential risk of betrayal could potentially threaten the patient’s willingness to be vulnerable and significantly reveal the depth of mental and physical injuries. Their specialized military training, therapeutic boundaries, personal presence and a steadfast moral code of ethics are qualifiers for this patient population in order to establish rapport and engagement in the program. Until assured of a safe and trusting environment, the PREP population tends to not fully engage in their therapies.7

**Nursing Practice**

All staff RNs must complete specialty training and education on traumatic brain injury, mTBI sequelae, and military culture. This training provides the framework for understanding the PREP patient population. Further recommendations include specialty certification for nurses working with this patient cohort, such as the Association of Rehabilitation Nurses’ Certified Rehabilitation Registered Nurse (CRRN) certification and the Certified Brain Injury Specialty (CBIS) certification from the Academy of Certified Brain Injury Specialists.

The PREP program includes strong nursing clinical coordination utilizing an assigned nurse practitioner (NP) and specialized rehabilitation nurses. During daily operations, the NP advocates for patients by supporting both the patient and the team. PREP’s population is complex with many comorbidities, including PTSD symptoms such as low anger tolerance thresholds. The NP is viewed as the “go to person” and problem solver for the patient and for team concerns. All rehabilitation nursing staff including the NP are trained in redirection and de-escalation techniques.

A particular nursing role in PREP is the registered nurse Clinical Care Coordinator (RN CCC). The RN CCC promotes patient autonomy and independence, provides education, and serves as the liaison between patients and family, interdisciplinary team members, and rehabilitation nursing staff. The RN CCC also works with the interdisciplinary team from admission to discharge, monitoring and evaluating patient and family responses to the plan of care and ensuring that short- and long-term goals are achieved. The RN CCC consistently supports sustainable reintegration into the community, utilizing the tenets of team building and communication.

An RN level of practice is required for the care and management of patients admitted into the PREP program. This operational standard meets the requirements outlined in the VHA Directive 1172.01 Polytrauma System of Care 8 and is key to meeting the complex needs of the individual for a high quality, successful program that supports rehabilitative goals while delivering positive patient outcomes. A multi-pronged training approach is essential for the nurses caring for PREP patients. Each aspect of training should be evidence-based and facilitate optimal outcomes for the mTBI population.

The Health Unit Coordinator (HUC), a non-clinical staff member, has proved to be an indispensable role in support of the PREP team nursing staff, interdisciplinary team members, and patients. The HUC’s unique role as a gatekeeper to the unit makes the HUC the focal point for the unit, providing social support to all team members and patients. The HUC maintains a mindful awareness of the flow of the unit, is observant of what the nursing staff is experiencing, and is intuitively aware of the patient’s mindset. These observations by the HUC are invaluable to nursing, as patients will often need to be notified in a timely manner of schedule changes such as additional x-rays, lab work, or consults.

**Insert “Figure 1: Active Duty and Veteran Experience: Integrated Approach”**

**Program Modifications Due to COVID-19**

              The onset of COVID-19 in early 2020 required changes at the Tampa VA Medical Center. The PREP inpatients were discharged home to be with their families, continuing their established treatment as outpatients. During this time period, VA telecommunication platforms were being established and modified to meet the ever-increasing demands of staff working remotely while continuing to treat patients via telemedicine. The use of telehealth technologies is an invaluable tool in providing health services and meeting the needs of patients, while avoiding direct contact in effort to mitigate the risk of COVID 19.9

           When it became apparent that the pandemic was going to continue longer than originally anticipated, a virtual intensive outpatient PREP program was established in July 2020. By the end of September 2020, this virtual program had provided service to 12 virtual patients. There were some unique challenges in the virtual outpatient program. An immediate primary challenge was to assist patients in dealing with competing personal demands for their time and attention, such as work, appointments with outside community medical providers, surgeries, new injuries, family, children - including home schooling and house or car needs (e.g., leaking roof, car maintenance).

With the need to rely on virtual care, the PREP team members encountered new experiences and developed enhanced skill sets. The PREP staff identified the need to accommodate the increased time required by virtual therapy and its logistical and technical issues. Individual weekly rounds were conducted with each patient. An hour of time was blocked for the Veterans Video Connect (VVC) teleconference meetings with providers, although some providers must continue to see patients face to face to complete evaluations (e.g., TBI Optometry and TBI Audiology). Overall, evaluations now require about 4 to 5 weeks in the outpatient setting, in comparison to the 3-week inpatient evaluation program.

                 The PREP interdisciplinary team holds joint virtual weekly meetings to discuss the care plans for current patients.  While the preferred and optimal treatment setting for this population is inpatient, the PREP team has successfully created a modified outpatient program, offering care during the current environment, which may be replicated for future needs.

**Summary**

The complex symptomology and chronic sequalae of mTBI related to the Global War on Terror led to the VA’s development and implementation of the Post-Deployment Rehabilitation and Evaluation Program. PREP provides a robust program of mTBI symptom assessment and evaluation. The arrival of COVID-19 required the development of a virtual program, assuring continuity of care.

The remaining PRCs are implementing similar programs at their facilities. As described above, the rehabilitation nursing workforce are key clinicians to PREP’s success. The NP’s role is integral to the cohesiveness of the program. The roles of the RN CCC and specialized rehabilitation nurses are fundamental to the patient care experience. The HUC is a strongly recommended position to facilitate communication and unit flow.

**References**

1. U.S. Department of Veterans Affairs. *Polytrauma/TBI System of Care*. <https://www.polytrauma.va.gov/system-of-care/index.asp>. Updated June 3, 2015. Accessed February 15, 2021.
2. 2. U.S. Congress. *Public Law 108-422*, Section 302:7327. <https://www.govinfo.gov/content/pkg/PLAW-108publ422/pdf/PLAW-108publ422.pdf> . November 30, 2004. Accessed February 15, 2021.
3. MacGregor AJ, Zouris JM, Watrous JR, et al. Multimorbidity and quality of life after blast-related injury among US military personnel: a cluster analysis of retrospective data. *BMC Public Health*, 2020; 20(1): 578. [doi:10.1186/s12889-020-08696-4](https://doi.org/10.1186/s12889-020-08696-4)
4. Smith EN, Young MD, Crum AJ. Stress. mindsets, and success in Navy SEALs  Special Warfare Training. *Front Psychol.* 2020; 10: 2962. doi:10.3389/fpsyg.2019.02962
5. Baker MS. Casualties of the Global War on Terror and their future impact on health care and society: a looming public health crisis. *Mil Med*. 2014; 179(4), 348–355. [doi.org/10.7205/MILMED-D-13-00471](https://doi.org/10.7205/MILMED-D-13-00471)
6. Commission on the Accreditation of Rehabilitation Facilities (CARF) International. *About CARF*. <http://www.carf.org/home/>. 2020. Accessed February 15, 2021.
7. Military.com. Special Operations Forces Center. https://www.military.com/special-[operations](https://www.military.com/special-operations). 2020. Accessed February 15, 2021.
8. U.S. Department of Veterans Affairs. Veteran Health Administration. *VHA Directive 1172.01 Polytrauma System of Care. Transmittal Sheet.* [https://www.va.gov/OPTOMETRY/docs/ VHA\_Directive\_1172-01\_Polytrauma\_System\_of\_ Care\_1172\_01\_D\_2019-01-24.pdf](https://www.va.gov/OPTOMETRY/docs/%20VHA_Directive_1172-01_Polytrauma_System_of_%20Care_1172_01_D_2019-01-24.pdf) . January 24, 2019. Accessed February 15, 2021.
9. Monaghesh E,  Hajizadeh A. The role of telehealth during COVID-19 outbreak: a systematic review based on current evidence. *BMC Public Health* 2020; 20(1), 1193. doi: 10.1186/s12889-020-09301-4

**Insert “Picture: PREP Team James A. Haley Veterans’ Hospital Tampa, Florida”**