

# Psychological Services

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# Polytrauma Transitional Rehabilitation Programs: Comprehensive Rehabilitation for Community Integration After Brain Injury

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When the U.S. Congress passed the Veterans Health Programs Improvement Act of 2004 and the Consolidated Appropriations Act in 2005, Veterans Affairs (VA) traumatic brain injury centers responded by establishing and developing the polytrauma rehabilitation centers and polytrauma transitional rehabilitation programs (PTRPs) across 4 sites in Minneapolis, Minnesota, Palo Alto, California, Richmond, Virginia, and Tampa, Florida, in 2007. The 5th PTRP was opened in 2011 in San Antonio, Texas. This article presents the context of establishing these programs within a VA system, describes aspects of programmatic design, and shares characteristics and outcomes of individuals served by the first 4 national centers. PTRPs provide specialized, interdisciplinary brain injury rehabilitation to active-duty service members and veterans with complex rehabilitation needs. A total of 286 individuals participated in the first 4 PTRPs during the first 3 years. Admission and discharge data were collected as part of routine care, and data review focused on describing the demographic, injury, and neurobehavioral functioning outcomes across 4 sites. Mayo-Portland Adaptability Inventory Abilities, Adjustment, and Participation subscales and total scale T-scores served as primary functioning outcome measures. Mean scores are presented. Statistical analysis found a significant change in total scale T-score from admission to discharge, consistent with improved patient functional ability. Challenges associated with the development and implementation of programs are discussed. Elements of programming may be applicable for other health care organizations that seek to improve rehabilitation care delivery.

*Keywords:* brain injury, interdisciplinary rehabilitation, neurobehavioral functioning, polytrauma, veterans

The United States began combat operations in 2001 in Afghanistan, referred to as Operation Enduring Freedom, and, in March 2003, the United States expanded military operations to Iraq, referred to as Operation Iraqi Freedom and later Operation New

Dawn. According to data from the Defense and Veterans Brain Injury Center, there were 320,344 traumatic brain injury (TBI) cases between 2000 and 2014. Of those, 264,344 were classified as mild, 26,548 were moderate, 3,171 were severe, 4,619 were penetrating injuries, and 21,662 were nonclassifiable (Defense and Veterans Brain Injury Center, 2014). In response to the growing numbers of veterans and active-duty service members in need of brain injury and multisystemic care, the U.S. Congress passed two laws enabling a system of health care to meet the complex rehabilitation needs of service members and veterans injured in combat. These two laws, the Veterans Health Programs Improvement Act of 2004 and the Consolidated Appropriations Act in 2005, were intended to ensure that severely injured service members and veterans could access the best of both modern medicine and integrative therapies for rehabilitation within the Veterans Affairs (VA) system, and resulted in the development of specialized, interdisciplinary rehabilitation programs to address the complex medical, psychological, and rehabilitative needs of those individuals (Lucille Beck, 2010).

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In 2005, the scope of services was expanded at existing VA TBI Lead Centers (Minneapolis, MN; Palo Alto, CA; Richmond, VA; and Tampa, FL) to include an integrated, multitiered system of interdisciplinary care for polytrauma and TBI injuries. The sites were renamed polytrauma rehabilitation centers (PRCs). *Poly-*

*trauma* is defined as two or more injuries sustained in the same incident that affect multiple body parts or organ systems and result in physical, cognitive, psychological, and/or psychosocial impairments and decreased functional ability. In response to continued care needs of those veterans who successfully progressed through acute rehabilitation but still required integrated services, resources were made available for development of polytrauma transitional rehabilitation programs (PTRPs), which were initiated across the four sites in 2007. Later that year, a fifth PRC/PTRP site in San Antonio, Texas, was designated, which officially opened several years later, in 2011. The development of these programs without restrictions imposed by dependence on third-party payers for revenue allowed a unique opportunity to build rehabilitation treatment around evidenced-based and theoretically based clinical practices, with a primary objective of providing high-quality care to active-duty service members and veterans. Extensive psychological intervention is a key component of the programs. PTRPs emphasize patient-centered goals. Neuropsychologists and rehabilitation psychologists in these settings are instrumental in helping patients and team members identify meaningful therapeutic goals. There are few restrictions on access to consultations by other specialty clinics (e.g., orthopedics, plastic surgery, optometry, etc.). Because community integration is a key component of treatment, PTRPs use recreation therapists and offer patients interdisciplinary co-treatments outside the traditional therapy session, such as community outings. Ongoing communication among the initial four sites allowed for coordination in program development, implementation of best practices, and systemic evaluation of patient outcomes.

Objectives of this article are twofold. First, aspects of the PTRPs are described, as developed with best practices in mind and geared toward optimizing the emotional health, social functioning, and overall quality of life of PTRP participants. Distinguishing aspects of these VA Health Care System programs are highlighted, although many aspects are potentially transferrable to work with civilian brain injury patient populations. Second, characteristics of the programs' initial patient population and functional outcomes are shared, based on data that were gathered as part of program improvement measurement and as established by national directives for the VA polytrauma system of care. The sites found it necessary to identify a meaningful internal benchmark for change in functional ability using the Mayo-Portland Adaptability Inventory (MPAI; Malec, 2005). At time of program development, national directives established use of the MPAI, but data were limited regarding meaningful outcomes with the polytrauma population. This article summarizes the initial program data identifying typical patient change found on this measure with this group of patients, which have been previously unpublished to our knowledge. Some of the limitations and challenges associated with polytrauma and transitional rehabilitation are also discussed.

### Description of PTRPs

#### Scope of Service

The PTRPs began as specialized rehabilitation programs for individuals with traumatic or acquired brain injury, as well as additional major systems injury or dysfunction (e.g., orthopedic injury, vision impairment, limb loss), that limit community reintegration. Table 1 outlines the initial program admission criteria.

Table 1

#### *Original Admission Criteria Across Four Polytrauma Transitional Rehabilitation Program (PTRP) Sites*

1. Medically documented history of acquired brain injury with a clearly defined impaired activity limitation preventing community independence<sup>a</sup>
2. Months since injury < 36<sup>a</sup>
3. Neurocognitive sequelae that can be addressed within the scope of PTRP services
4. Requires supervision and/or assistance to complete complex activities of daily living
5. Independent or requires only occasional assistance with basic activities of daily living
6. Able to participate in and benefit from group-based interdisciplinary interventions under the guidance of the physical medicine and rehabilitation department
7. Abstinent from use of substances
8. Willing to adhere to medication regimen during PTRP stay
9. Medically stable (i.e., no infectious disease, no sepsis, no delirium)
10. Able to endorse understanding, willingness, and motivation to participate in PTRP and adhere to the facility rules
11. Does not exhibit behaviors that pose risk/safety threat to self and/or others or that require alternative mental health services or setting

<sup>a</sup> These criteria have been altered since the time of data collection presented in this article. Currently, criterion for time since injury has been removed and some sites accept patients with primary injuries other than acquired brain injury (e.g., spinal cord injury, psychiatric condition).

Program data were collected during the initial years of each of the PTRPs. Based on analysis of data collected through 2010, patients were primarily male, had a mean age of 30 years, and 65% were unmarried (see Tables 2 and 3). All branches of the military were represented, with most serving or having served in the Army, Marines, or Navy. At each site, severity of brain injury ranged from mild to severe, using Department of Defense/Veterans Affairs consensus-based classification criteria (Benedict et al., 2010). When severity was dichotomized into mild versus moderate-severe, contingency table analysis found no significant difference across sites in level of severity,  $\chi^2(3, N = 230), p = .05$ . However, differences in coding across sites resulted in a significant amount of missing data regarding severity (21.8%), potentially reducing the ability to detect meaningful differences. The percentage of mild injuries within sites, based on available data, ranged from 13.9% in Tampa to 34.7% in Richmond. The typical length of stay across the PTRPs was 4 to 5 months, but ranged from a few weeks to longer than 10 months (see Table 3). Upon discharge, patients entered into a variety of community settings (see Table 2), with the most common settings being independent living in a home or apartment alone or with family (56% to 73%) and military housing (11% to 29%). Patients also discharged to Warrior Transition Units or assisted/supervised living environments, although this was not tracked specifically during the time period of data collection.

In PTRPs, interdisciplinary rehabilitation services are customized to help optimize each patient's transition back to his or her community after polytraumatic injury. Programming is holistic and targets physical, cognitive, communicative, behavioral, psychological, and social functioning. Patients reside in a shared home-like environment, with 24-hr nursing staff as well as other staff available onsite as needed. In this sense, PTRPs were designed to serve as the "bridge" between acute inpatient treatment and successful community integration. Services are provided in individual and

Table 2  
*Percentages of Patients Across Four Polytrauma Transitional Rehabilitation Program Sites*  
 (N = 286)

Variable	Minneapolis (n = 56)	Palo Alto (n = 56)	Richmond (n = 131)	Tampa (n = 43)
Military/veteran status				
Active duty	53.0	67.3	77.0	44.2
Veteran	47.0	32.7	23.0	46.5
Service branch				
Army (active & reserve)	48.3	47.3	57.0	37.2
Air Force	5.3	12.7	5.0	4.7
Army National Guard	0.0	5.5	3.0	9.3
Coast Guard	0.0	1.8	0.0	0
Marines (active & reserve)	23.2	18.2	27.0	11.6
Navy	10.7	12.7	9.0	16.3
Service branch (active duty only)				
Army	41.1	47.3	52.6	52.6
Air Force	1.8	12.7	4.0	10.5
Army National Guard	0.0	5.5	2.0	10.5
Navy	3.6	12.7	4.0	15.8
Marines	7.1	18.2	29.0	0.0
Discharge disposition				
Community with family member or spouse	73.2	38.2	56.0	58.1
Military housing	10.7	29.1	27.0	16.3
Community, alone	— <sup>a</sup>	18.2	3.0	14.0
Community with assistance	16.1	9.1	1.0	4.7
Other	0.0	5.5	20.0	7.0

Note. Percentages totaling < 100% reflect missing data.

<sup>a</sup> For this site, the categories of Community, alone and Community with family member were collapsed locally and are reflected in Community with family.

group formats, both onsite and in the local community. The PTRPs' primary goals are to maximize the individual's independence and facilitate successful return to active duty, work, school, or other personally meaningful activity within the community. Services are comprehensive, which is supported through nationally established directives outlining the rehabilitation staff composition

(see Figure 1 for treatment team members) and scope of services (Department of Veterans Affairs, 2012). Rehabilitation psychologists and neuropsychologists are fundamental providers on each treatment team, along with traditional rehabilitation therapists. Additional services include case management, vocational rehabilitation services, and assistive technology. Individuals who require

Table 3  
*Patient Variables and Mayo–Portland Adaptability Inventory—4 (MPAI) Discharge Scores and Change From Admission to Discharge Across Four Polytrauma Transitional Rehabilitation Program Sites*

Variable	Minneapolis (n = 56)	Palo Alto (n = 56)	Richmond (n = 131)	Tampa (n = 43)	All sites (N = 286)
Mean (SD) age (years)	31.7 (10.8)	28.6 (8.2)	29.2 (7.8)	31.98 (10.9)	30.0 (9.1)
Mean (SD) time since injury to admission (days)	611.1 (773.9)	200.3 (57.2)	404.2 (548.9)	395.1 (597.4)	409.2 (575.6)
Mean (SD) length of stay (days)	—	168.8	60.3	138.4	—
Severity of brain injury (%)					
Mild	25.0	7.3	31.3	11.6	21.8
Moderate	23.4	16.4	21.4	11.6	16.7
Severe	48.4	76.4	37.4	60.5	39.8
Mean (SD) MPAI scale discharge scores (T scores)					
Total	32.6 (9.6)	31.5 (10.9)	38.5 (8.1)	37.5 (9.8)	35.6 (9.7)
Abilities	35.4 (9.5)	34.9 (10.0)	39.6 (8.5)	38.4 (8.3)	37.5 (9.2)
Adjustment	38.5 (9.0)	37.0 (11.0)	43.3 (10.0)	41.2 (8.7)	40.7 (10.1)
Participation	32.4 (9.4)	31.3 (11.1)	37.3 (6.5)	36.4 (10.7)	34.9 (9.2)
Mean (SD) MPAI scale change (T scores)					
Total	−7.1 (7.1)	−13.6 (8.9)	−8.2 (6.1)	−8.8 (7.3)	−9.1 (7.4)
Abilities	−7.3 (8.4)	−11.9 (7.5)	−7.4 (5.8)	−8.5 (4.8)	−8.4 (6.9)
Adjustment	−4.6 (7.4)	−10.3 (10.4)	−5.3 (6.8)	−5.4 (7.8)	−6.1 (8.1)
Participation	−6.1 (6.4)	−11.5 (8.9)	−6.7 (5.5)	−8.6 (10.7)	−7.8 (7.6)

Note. Decrease in scores reflects lower functional impairment; — and percentages totaling < 100% reflect missing data.

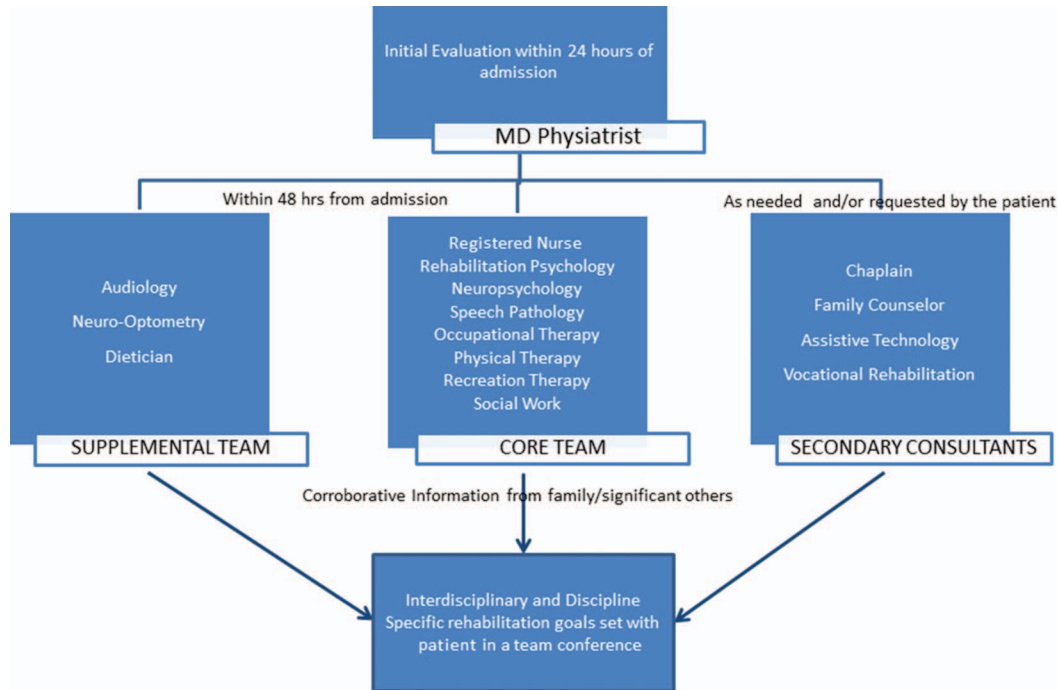


Figure 1. Polytrauma transitional rehabilitation programs admission evaluation process. The color version of this figure appears in the online article only. See the online article for the color version of this figure.

additional medical care or services (e.g., orthopedics, dental, audiology, etc.) receive care at the associated VA medical center.

Each patient has a comprehensive plan of care that considers personal goals, strengths and weaknesses, cultural values, and learning styles. Both neuropsychology and rehabilitation psychology providers' initial assessments are used in development of this plan. Individual and group programming are offered, which provide opportunities to practice interpersonal interaction and communication, social support, and community involvement. Most patients attend 5 to 6 hr of weekday therapies, with leisure activities facilitated by recreation therapy service or other staff available in the evenings and on the weekends. Therapeutic activities in the community are varied and patient-centered, and may include public transportation training; group or individual volunteer activities; participation in sporting events such as adaptive cycling, fishing, sailing, equine therapy, or aquatics; attending technical or academic training events; or outings to local attractions.

Patients' family and social supports are integrated into the therapeutic activities, with patients' consent or assent. Patients are also encouraged to visit with friends or family off-site. This is considered a *therapeutic pass* and may last from hours to several days. Passes are intended to provide leisure and respite as well as a real-world opportunity to practice the reintegration skills learned during the course of treatment. The timing and goals of the passes are planned in collaboration with patients and/or family so as to minimize any risks to patients and maximize therapeutic gains when outside of a structured environment. The rehabilitation psychologist, with input from other team members, works closely with the rehabilitation team, patients, and families to prepare for a successful experience. Typically, treatment-related goals are identified for each pass.

## Admission Evaluations

A comprehensive medical records review is conducted by the PTRP medical director prior to patient admission. The rehabilitation psychologist and neuropsychologist are frequently consulted to offer recommendations regarding the fit of the patient, given the scope of services offered. Once determined to meet admission criteria, the patient is admitted and undergoes a comprehensive evaluation in accordance with guidelines published nationally by the Department of Veterans Affairs (2012). Figure 1 shows a graphic representation of the evaluation process. Patient evaluations are supplemented by information from collateral sources, such as family members. Patient and family goals are solicited during initial evaluations with all team members, although cognitive deficits, poor awareness of deficits, and/or poor adjustment to injuries may limit the patient's ability to formulate targeted goals at the outset of treatment. Based on evaluation findings, treating professionals both outline discipline-specific goals with the patient/family and collaborate to develop treatment plans to address patient and family goals across disciplines, using an interdisciplinary model. Goals and progress are generally revisited weekly or biweekly in interdisciplinary team conferences and at regular intervals with patients and families throughout the course of treatment so that treatment remains patient-centered and goal-oriented.

## Medical and Nursing Management

The primary goals of medical intervention are to minimize barriers to rehabilitation, maximize rehabilitation gains, and maintain patients in optimal health. The PTRP medical director monitors the medical needs of patients and coordinates care with other consultants and treatment programs (e.g., for amputations, burns,



orthopedic injuries, or spinal cord injuries). Patients may be temporarily admitted to hospital units or even other VA facilities to receive surgical intervention. A plan for healthy maintenance of nutrition and weight is developed and implemented. Intervention may involve selecting medications to address the varied cognitive and behavioral symptoms of brain injury, with consideration given to the negative impact that some medications may have on cognitive function. Reviews of the literature suggest several viable medication options for hypoarousal, attention, and memory (Writer & Schillerstrom, 2009). Disordered sleep is often targeted with medications to assist with sleep onset, commonly medications with sedating side effects. Evidence-based psychological intervention focused on improving sleep hygiene or consolidating fragmented sleep may supplement, such as cognitive-behavioral therapy for insomnia (e.g., Talbot et al., 2014), with adaptations to accommodate the level of cognitive ability. Clinically significant pain occurs in a large proportion of patients who have sustained polytrauma injuries, even when brain injury is mild (Sayer, 2012). Management of pain is typically conducted with a combination of medications and additional therapies (e.g., physical agent modalities, manual therapies), many of which are provided by rehabilitation psychologists (e.g., progressive muscle relaxation instruction, activity pacing, etc.). Complementary and alternative medicine treatment options (e.g., acupuncture, tai chi, yoga) are also considered on the basis of patient preferences. As the VA system maintains responsibility for health care of veterans across their life span, long-term health effects of potential treatments are considered.

A primary component of nursing assessment and treatment involves medication administration. A self-medication management program is initiated upon the patient's admission. The program involves a series of levels whereby the patient demonstrates greater independence with medication administration over time, using skills learned in therapies. The patient progresses to a more advanced level once medical staff can document consistent success at the current level over a sustained period.

### Psychological and Psychiatric Management

As has been well documented in the literature, individuals with brain injury commonly experience significant difficulties with emotional, behavioral, and social functioning, in addition to functional deficits, which can persist for years postinjury (Gordon et al., 2006). At admission, comprehensive evaluations are conducted by the neuropsychologist, rehabilitation psychologist, and psychiatrist. Both neuropsychologists and rehabilitation psychologists provide team consultation for interdisciplinary goal-setting, assess decision-making capacity and risk, and assist in the coordination of services with other mental health programs. The specific role of the neuropsychology and rehabilitation psychology provider may differ somewhat across PTRP sites depending on provider specialties, for example, but both conduct comprehensive assessments of patient functioning. Rehabilitation psychologists across sites also provide direct intervention.

The neuropsychology evaluation includes detailed assessment of the patient's cognitive abilities, including areas of strength and impairment, capacity for use of compensatory strategies, emotional and behavioral symptoms of injury (including level of awareness of deficits), and decision-making capacity for medical, financial, and health care decisions. The evaluation may include

more formal assessment of personality or sleep patterns. Data are used to inform understanding of the patient's behavioral presentation after injury. Areas of cognitive impairment are shared with team members to inform planning of cognitive rehabilitation, which may be conducted by speech therapy or occupational therapy, often in collaboration with psychology providers. Preexisting or co-occurring conditions with the potential to impact a patient's rehabilitation treatment or outcome are identified in both neuropsychology and rehabilitation psychology evaluations, with common conditions including previous neurological conditions (e.g., mild TBIs), comorbid psychiatric (e.g., depression, posttraumatic stress disorder [PTSD]) or substance abuse disorders, personality styles impacting interpersonal interactions, and level of existing family, community, or military support for independence.

The rehabilitation psychology evaluation also typically involves detailed psychosocial assessment including cultural background, trauma history, evaluation of preferred coping styles, assessment of patient's (and often family's) level of adjustment to injuries, and an evaluation of risk of harm to self or others. The commonly found co-occurring conditions, such as depression (Rapoport, 2012; Seel et al., 2003), anxiety disorders (Bertisch et al., 2013), fatigue, behavioral agitation, or emotional deregulation (Lippert-Grüner, Kuchta, Hellmich, & Klug, 2006), are identified and targeted as treatment goals.

The psychiatric evaluation is typically briefer, but includes psychosocial and psychiatric history, as well as assessment of current behavioral symptoms associated with injury and associated risks. Relevant laboratory tests may be ordered to identify additional conditions contributing to psychiatric presentation. Emotional and behavioral dysregulation, sleep disorder, or psychiatric disorders may be targeted with medications, with consideration given to the etiology of injury and cognitive side effects.

Through consultation with the interdisciplinary team, the information gained from mental health evaluations is also used for development of the interdisciplinary treatment plan addressing cognitive, behavioral, and social functioning. If necessary, services are coordinated with other mental health programs to provide more intensive specialty interventions, such as those related to alcohol and/or drug abuse. When PTSD is present and the patient is able to engage in treatment, evidence-based therapies such as prolonged exposure therapy (Wolf, Strom, Kehle, & Eftekhari, 2012) or cognitive processing therapy (Walter, Dickstein, Barnes, & Chard, 2014) are provided. The intervention is conducted with the rehabilitation psychologist at some sites; at others, it is arranged with other specialty providers in the hospital. Within the prolonged exposure treatment model, the rehabilitation psychologist may consult, collaborate, and cotreat with other PTRP therapists (most commonly recreation therapists and occupational therapists) to facilitate the patient's in vivo exposure in the local community environment at appropriate points.

In PTRP patients, manifestations of poorly regulated behavior, such as impulsivity or lack of initiation, have the potential to create risks to patient health and safety, interfere with attainment of rehabilitation goals, and/or disrupt the residential therapeutic milieu. Diminished awareness of deficits and inaccurate self-appraisal can result in poor understanding of the relevance of rehabilitation therapies, leading to reduced engagement in the therapeutic process. From program admission, patients are followed by mental health professionals, with goals of managing the

varied behavioral and emotional concerns that arise during a patient's rehabilitation, treating comorbid psychiatric conditions, and maximizing the patient's adjustment to injury and participation in social roles. The rehabilitation psychologist or neuropsychologist, in conjunction with the treatment team and patient, develops a plan to target emotional or behavioral dysregulation. This may involve reducing environmental contributions to behaviors and/or reinforcing socially adaptive behavior. Medication management of emotional dysregulation may be considered by the psychiatrist. Family members are included in the management plan, when possible. Plans involve identification of antecedents to agitation or emotional/behavioral dysregulation, such as exposure to overstimulating or unstructured environments, emotionally salient situations, or involvement in activities that are highly challenging because of the patient's reduced cognitive abilities. Factors such as sleep impairment, increased fatigue, or increased pain may also contribute to emotional dysregulation, and become targets for behavioral intervention. In addition to environmental management, the patient is taught strategies for self-regulation, with cueing and support from staff as needed to maximize successful emotional and behavioral regulation. Advancement to a more independent level in therapy activities may be contingent on the patient being able to master self-regulation of specific behaviors, thereby serving as a behavioral reinforcer. Mental health providers track the patient's progress with the plan and meet with the patient to provide feedback and adjust the plan, as needed.

### **Family Support and Education**

Education and support for family members of individuals who have sustained brain injuries are crucial components of the rehabilitation process (Lezak, 1988; Williams & Kay, 1990). In the polytrauma system of care, six primary family needs have been identified: health information, emotional support, instrumental support, professional support, community support, and involvement with care (Wilder Schaaf et al., 2013). Patients' consent or assent to family involvement in rehabilitation is sought upon admission. Given the nature of the active-duty service members' deployments and family/social systems, family members may not live in the community where the PTRP patient is being treated. This necessitated the development of means of providing family services in creative and nontraditional ways, along with providing traditional services for families living locally. Teleconferences (audio or audio/visual) are routinely used for both formal and informal meetings with the treatment providers, during which updates are exchanged with family members or other support persons whom the patient designates. On a formal basis, family meetings (including patient, family members, and interdisciplinary treatment team) occur upon admission and discharge, typically coordinated by the social worker. Additional formal meetings are arranged either on a scheduled basis (e.g., every 4 to 6 weeks) or whenever needed during a patient's PTRP stay to keep all stakeholders apprised of patient progress and allow for changes to the treatment plan. On an informal basis, meetings/teleconferences take place with family members as needed for educational or treatment planning purposes. Family feedback regarding the patient's goal completion is requested after therapeutic passes. For active-duty service members, PTRP social workers also coordinate with military liaisons who may participate in patients' family

meetings and interdisciplinary team meetings. Liaisons may provide additional supportive services and/or instrumental aide in accordance with the culture of the military system. They typically help to ensure a smooth handoff, often back to a military base or military treatment facility for outpatient therapies. Military liaisons are generally located onsite for the Army, Navy, and Marines, with Air Force liaisons available off site.

Educational sessions and resources are provided to family members to ensure safety, comfort, and increased knowledge for both the patient and family members. Psychology providers, in conjunction with social work providers, have a key role in assessing family emotional adjustment and needs. Rehabilitation is aimed toward promoting independence as the patient progresses in therapy. Accordingly, a shift in family involvement occurs in a parallel fashion. Initially, the treatment team provides abundant injury-related education and training to the family, and intervention may be geared toward developing trust and a collaborative working relationship with family members. As the patient gains independence, the team educates the family about therapeutic activities and how the family can support the goal of independence (e.g., family member cueing a patient to use his or her Smartphone to find information rather than supplying it). The family is encouraged to learn the patient's care needs, compensatory strategies, and skills for managing symptoms in a community setting. Family members are often invited to participate alongside their loved one in group educational activities or outings. Team members provide readings, handouts, and online resources (in English or Spanish) to family members on an individually tailored basis, typically using up-to-date information from the Defense and Veterans Brain Injury Center, the National Center for PTSD, and the Defense Center of Excellence for Psychological Health and Brain Injury.

In addition, a designated family counseling professional (i.e., licensed clinical social worker) is available at all sites. When consulted, these therapists provide emotional support and intervention services to family members and significant others, addressing educational and emotional needs as well as self-care issues. PTRP psychologists coordinate referrals to the family therapist. Resources are also provided via family support groups and family/caregiver workshops offered through the polytrauma system of care and/or the Defense and Veterans Brain Injury Center. Family needs are managed on an individualized basis, taking into account relevant cultural considerations and family dynamics, and are also a focus of interdisciplinary collaboration. For example, the family's primary language may be Spanish among Hispanic PTRP patients, in which case translators (staff or family designated) are involved in family meetings, and Spanish-speaking staff members may take more central roles in providing family support or education.

### **Tracking of Recovery and Discharge Planning**

Treatment plans and patient goal progress are updated at interdisciplinary team meetings every 2 weeks (4 weeks at one site), with ongoing input from patients and family members. Patients complete an initial 2-week evaluation period, after which an assessment of current functional status is completed using the MPAI (Malec, 2005) by team consensus rating. At the initial meeting, patient and family goals are discussed, consistent interdisciplinary team goals are identified, interventions and strategies are devel-

oped and coordinated, and the anticipated length of stay necessary to meet goals is discussed.

Examination of items rated as impaired on the MPAI facilitates the development of an interdisciplinary treatment plan. This 35-item instrument was designed to assist in the clinical evaluation during the postacute period following acquired brain injury, and contains items representing common physical, cognitive, emotional, behavioral, and social problems that are encountered following brain injury. Items compose three clinical scales: Abilities, Adjustment, and Participation. A total score is also calculated. In addition, six supplemental items allow assessment of major obstacles to community integration that may result from brain injury or problems in the social environment (e.g., substance abuse, legal problems). For each scale item, a rating is made along a continuum of *normal functioning* (0) through *severe impairment* (4) in functional ability, with high scores indicative of greater impairment. Initial evaluations of the psychometric properties have demonstrated adequate internal consistency and concurrent validity (Malec, 2004; Malec et al., 2003; Malec & Thompson, 1994), with more desirable psychometric properties noted when ratings were derived from combined sources (i.e., consensus ratings) rather than relying on the individual patient or collateral report. The MPAI is completed again at discharge, to allow examination of functional changes occurring over the course of rehabilitation treatment.

In PTRPs and PRCs, as in the VA health care system generally, patients remain eligible for services for their lifetime, longer than might be otherwise possible in a private pay setting. This allows opportunities to planfully transition to the community in a manner that is sustainable over time. Multiple factors are taken into account when determining time of discharge from PTRPs. Optimally, discharge occurs with the attainment of the patient's and family's functional community reintegration goals, although other reasons for discharge may include a need for a more intense level of medical or psychological care, the patient's inability to adhere to program rules necessary to maintain a safe therapeutic milieu, patient/family/military preference, or plateau with goals. Timing of discharge is a joint decision made by the interdisciplinary treatment team in consultation with the patient, patient's family members, and, in the case of the active-duty service member, the patient's military command. Any additional rehabilitation services necessary to support continued success in the next community environment are arranged prior to patient's discharge.

### PTRP Patient Outcomes

At the time of program development, national policy directed the use of the MPAI as a common functional outcome measure across PTRP sites. Although some prior research has examined changes on the MPAI following rehabilitation, no standard benchmark exists for comparison of PTRP patient change. One study measured change on the MPAI following outpatient comprehensive day treatment for civilians with acquired brain injury by examining percentage of change in total score from admission to discharge. This study found percentage of change ranging from 25% to 50%, suggesting that the measure is sensitive enough to capture change in individuals with postacute brain injury (Micklewright, Yutsis, Smigielski, Brown, & Bergquist, 2011). However, mean change in standard scores was not reported. Therefore, the PTRPs used early program data through 2010 to generate a

national benchmark to evaluate individual polytrauma patient changes more meaningfully, for purposes of conducting program evaluation and performance improvement activities. In the MPAI-4 manual, standard score conversions ( $M = 50$ ,  $SD = 10$ ) have been generated on the basis of a reference sample of 396 individuals with acquired brain injury. Across all PTRP sites, a mean change of 9.09 on the total scale standard score was found, with a standard deviation of 7.42 (see Table 3). Moreover, improvements were found across all subscales on the MPAI. A statistical test was conducted to evaluate whether the change found on this measure differed from chance. A paired samples  $t$  test was conducted using admission MPAI total standard scores ( $M = 35.62$ ,  $SD = 9.73$ ) and discharge MPAI total standard scores ( $M = 44.71$ ,  $SD = 8.35$ ), and found that discharge scores were significantly lower than those at admission,  $t(239) = 18.97$ ,  $p = .000$ , signifying significant decreases in impairment.

### PTRP Challenges

Numerous challenges were present in the development of the PTRP programs, several of which are highlighted here. Initially, processes needed to be developed to allow consideration of the multiple stakeholders involved in polytrauma patients' rehabilitation. Prior to the development of the PRCs, systemic mechanisms for integrated inclusion of family members into treatment planning did not exist. With the changing patient population, the need for these processes became apparent across the rehabilitation spectrum, as the VA system previously had not been widely perceived as "family friendly." In PTRPs, this prompted initial efforts toward staff education and development of treatment models supportive of family inclusion. Across sites, staff retreats and a national conference were used to develop and support models of integrated, interdisciplinary treatment, inclusive of family stakeholders. With the increase in active-duty service members, military liaisons representing interests of the armed services also needed to be incorporated. Over time, the specific roles of military liaisons on the rehabilitation teams were negotiated and became more clearly delineated. However, an ongoing challenge facing the PTRP teams is how to best resolve situations in which stakeholders' interests are in conflict. For example, a patient or family member may express preference for a discharge setting that is different from the military's. Such conflicts are a challenge that must be resolved to best target patient services to the appropriate discharge setting.

Another major challenge during program development was identification of relevant programming, both in terms of traditional rehabilitation services and mental health intervention. Although programs were geared toward evidence-based treatment, value was also placed on interventions with less robust empirical support. For example, programming across sites includes aspects of cognitive rehabilitation. Programming targets remediation of deficit areas and development of compensatory skills, such as with memory strategy training, metacognitive strategy training for executive dysfunction, and practice of skills related to social communication. Although many interventions are consistent with recommendations from the American Congress of Rehabilitation Medicine (Haskins et al., 2012), a report from the Institute of Medicine (2011) has found the evidence supporting use of comprehensive cognitive rehabilitation therapy to be inconclusive. Similarly, although support for cognitive-behavioral psychological intervention exists for



cognitively intact civilian populations (e.g., Resick, Nishith, Weaver, Astin, & Feuer, 2002; Resick, Williams, Suvak, Monson, & Gradus, 2012), evidence is only beginning to be established for effectiveness in combat or brain injury populations (e.g., Monson, Price, & Ranslow, 2005; Wolf et al., 2012); and virtually nothing is known about utility with patients with severe brain injuries, such as those frequently served in PTRPs. It will be necessary to accumulate greater evidence supporting services provided. However, there are difficulties inherent in quantification of program elements in a brain injury treatment setting for research purposes. As the setting is patient- and treatment-focused, intervention is inevitably and purposefully changed and adapted to meet the individual needs of any given patient, and implementing systematic application of interventions such as would be required for quality research is difficult and, at times, clinically contraindicated.

Another ongoing challenge is the identification of meaningful measures to evaluate program goals and outcomes. Although patient emotional adjustment is a valued program outcome, there is currently only an assessment in place at program discharge, whereas longer term data may be more relevant or informative. In looking at the changes in the subscales on the MPAI at discharge, we found that the Adjustment scale shows the smallest change. Clinical observation suggests that for many individuals with severe brain injury, the level of depression or anxiety experienced may actually increase as the patient becomes more aware of the nature of his or her injuries and their impact in social and community environments. However, increased awareness is arguably necessary to enable improved functioning in terms of being able to identify when the use of compensatory strategies for deficits is necessary to enable success. Therefore, evaluation at a time removed from discharge may be more valuable in assessing long-term emotional adjustment. Long-term functional outcomes in this patient population, such as return to employment, school, or other meaningful productive activities, are as of yet relatively unexamined as well. The relationship between changes on the MPAI outcome measure and practical activities will need to be investigated to assess the measure's usefulness as a predictor, along with consideration of alternative and supplementary measures. Toward that end, the VA has entered into collaborative relationships (e.g., with TBI model systems) and has been working on creating the infrastructure (including system-wide databases) that allows for and promotes opportunities for research and other systematic evaluations of our patients, programs, and outcome data.

## Discussion

The VA polytrauma system of care had a need to develop innovative and comprehensive treatment programs to meet the needs of service members returning from Operation Enduring Freedom/Operation Iraqi Freedom conflicts with complex polytrauma injuries. Rehabilitation psychologists and neuropsychologists were identified as essential core PTRP team members, allowing for questions of patient adjustment, behavioral and social functioning, and quality of life issues to be routinely considered in the development of treatment plans. Given the resources mandated at a national level, these programs were able to develop longer term, integrated, interdisciplinary rehabilitation care focused primarily on patient goal attainment and maximization of indepen-

dence in functioning and community reintegration. Key components of PTRPs were outlined, with the expectation that some components will be relevant to provision of treatment with other patient populations. Initial data from the primary program outcome measure were compiled and analyzed, finding a mean change of 9.09 in the total scale standard score of the MPAI. Considerable variability in change across patients was found, as noted by the standard deviation. Identification of this national benchmark will now allow for more meaningful evaluation of program components, in that analysis can be conducted at the program levels to isolate variables associated with patients falling short of or exceeding the benchmark, to better inform further program development.

This project had multiple limitations. One significant limitation was the amount of missing data across sites regarding severity of injury, which limited our ability to investigate differences in MPAI change scores among individuals with mild, moderate, and severe levels of brain injury at a national level. Given the variability in changes scores found, it is possible that injury severity may be a significant factor contributing to variability in outcome. Although our analyses found no significant difference in injury severity between sites, limitations inherent in the data prevented further investigation into what may be meaningful patient differences, a difficulty to be addressed in the future with the creation of a system-wide database. Also, available outcome data were collected as part of routine clinical care across treatment programs, involving multiple disciplines at various sites. It is possible that rater bias influenced outcome ratings on the MPAI. Certification in use of the MPAI does not yet exist. To address this, calibration of the measure across sites was done through development of a shared internal training plan and use of monthly conference calls to review rating procedures and develop consensus regarding cases with circumstances specific to the polytrauma system of care. Limitations are also associated with the use of the MPAI for tracking outcomes and progress, as well. Although reference data were used, true normative data for comparison to individuals without brain injury are not available.

Although many challenges inherent in development of the initial PTRPs have been resolved, many remain and the continued evolution of the programs brings new challenges. Programming continues to evolve to accommodate the changing needs of active-duty service members and veterans. For example, the initial admission criterion of brain injury less than 3 years prior to admission has been relaxed. Site-specific examination of patient data has found meaningful clinical change occurring in patients with injuries greater than 3 years prior. This has been particularly true for individuals who did not access rehabilitation services acutely and never learned strategies for compensation for deficit areas. The programs have expanded to admit individuals with more traditional general rehabilitation needs, as well (e.g., spinal cord injury, amputation, etc.). Future research will be necessary to demonstrate the utility of programming with this expanded population. Investigation is needed to explore the attainment of meaningful, sustainable outcomes.

## References

- Benedict, S., Belanger, H., Ceperich, S., Cifu, D., Cornis-Pop, M., Lew, H., & Meyer, K. (2010). *Traumatic brain injury*. Washington, DC: Department of Veterans Affairs.

- ment of Veterans Affairs Employee Education System. Retrieved from <http://www.publichealth.va.gov/docs/vhi/traumatic-brain-injury-vhi.pdf>
- Bertisch, H. C., Long, C., Langenbahn, D. M., Rath, J. F., Diller, L., & Ashman, T. (2013). Anxiety as a primary predictor of functional impairment after acquired brain injury: A brief report. *Rehabilitation Psychology, 58*, 429–435. <http://dx.doi.org/10.1037/a0034554>
- Defense and Veterans Brain Injury Center. (2014). *DoD worldwide numbers for TBI*. Retrieved from [http://www.dvbic.org/sites/default/files/uploads/2000-2013%20up%20to%20Q2-dod-tbi-worldwide-2000-2013-Q2-as-of-Q1-Q2-13\\_01-08-13RDS.pdf](http://www.dvbic.org/sites/default/files/uploads/2000-2013%20up%20to%20Q2-dod-tbi-worldwide-2000-2013-Q2-as-of-Q1-Q2-13_01-08-13RDS.pdf)
- Department of Veterans Affairs. (2012). *Physical Medicine and Rehabilitation Service Transitional Residential Bed Section, 1172.02*. Retrieved from [http://www.va.gov/vhapublications/ViewPublication.asp?pub\\_ID=2244](http://www.va.gov/vhapublications/ViewPublication.asp?pub_ID=2244)
- Gordon, W. A., Zafonte, R., Cicerone, K., Cantor, J., Brown, M., Lombard, L., . . . Chandna, T. (2006). Traumatic brain injury rehabilitation: State of the science. *American Journal of Physical Medicine & Rehabilitation, 85*, 343–382. <http://dx.doi.org/10.1097/01.phm.0000202106.01654.61>
- Haskins, E., Cicerone, K., Dams-O'Connor, K., Eberle, R., Langenbahn, D., & Shapiro-Rosenbaum, A. (2012). *Cognitive rehabilitation manual: Translating evidence-based recommendations into practice*. Reston, VA: American Congress of Rehabilitation Medicine.
- Institute of Medicine. (2011). *Cognitive rehabilitation therapy for traumatic brain injury: Evaluating the evidence*. Washington, DC: National Academies Press. Retrieved from <http://www.iom.edu/Reports/2011/Cognitive-Rehabilitation-Therapy-for-Traumatic-Brain-Injury-Evaluating-the-Evidence.aspx>
- Lezak, M. D. (1988). Brain damage is a family affair. *Journal of Clinical and Experimental Neuropsychology, 10*, 111–123. <http://dx.doi.org/10.1080/01688638808405098>
- Lucille Beck (2010, May 5). *Statement of the Department of Veterans Affairs. U.S. Senate Committee on Veterans' Affairs*. Washington. Retrieved from <http://www.va.gov/OCA/testimony/svac/100505LB.asp>
- Lippert-Grüner, M., Kuchta, J., Hellmich, M., & Klug, N. (2006). Neurobehavioural deficits after severe traumatic brain injury (TBI). *Brain Injury, 20*, 569–574. <http://dx.doi.org/10.1080/02699050600664467>
- Malec, J. F. (2004). The Mayo–Portland Participation Index: A brief and psychometrically sound measure of brain injury outcome. *Archives of Physical Medicine and Rehabilitation, 85*, 1989–1996. <http://dx.doi.org/10.1016/j.apmr.2004.01.032>
- Malec, J. (2005). *The Mayo–Portland Adaptability Inventory*. Retrieved from <http://www.tbims.org/combi/mpai>
- Malec, J. F., Kragness, M., Evans, R. W., Finlay, K. L., Kent, A., & Lezak, M. D. (2003). Further psychometric evaluation and revision of the Mayo–Portland Adaptability Inventory in a national sample. *The Journal of Head Trauma Rehabilitation, 18*, 479–492. <http://dx.doi.org/10.1097/00001199-200311000-00002>
- Malec, J., & Thompson, J. (1994). Relationship of the Mayo–Portland Adaptability Inventory to functional outcome and cognitive performance measures. *The Journal of Head Trauma Rehabilitation, 9*, 1–15. <http://dx.doi.org/10.1097/00001199-199412000-00003>
- Micklewright, J. L., Yutsis, M., Smigielski, J. S., Brown, A. W., & Bergquist, T. F. (2011). Point of entry and functional outcomes after comprehensive day treatment participation. *Archives of Physical Medicine and Rehabilitation, 92*, 1974–1978. <http://dx.doi.org/10.1016/j.apmr.2011.07.199>
- Monson, C., Price, J., & Ranslow, E. (2005). Treating combat PTSD through cognitive processing therapy. *Federal Practitioner, 22*, 75–83.
- Rapoport, M. J. (2012). Depression following traumatic brain injury: Epidemiology, risk factors and management. *CNS Drugs, 26*, 111–121. <http://dx.doi.org/10.2165/11599560-000000000-00000>
- Resick, P. A., Nishith, P., Weaver, T. L., Astin, M. C., & Feuer, C. A. (2002). A comparison of cognitive-processing therapy with prolonged exposure and a waiting condition for the treatment of chronic posttraumatic stress disorder in female rape victims. *Journal of Consulting and Clinical Psychology, 70*, 867–879.
- Resick, P. A., Williams, L. F., Suvak, M. K., Monson, C. M., & Gradus, J. L. (2012). Long-term outcomes of cognitive-behavioral treatments for posttraumatic stress disorder among female rape survivors. *Journal of Consulting and Clinical Psychology, 80*, 201–210. <http://dx.doi.org/10.1037/a0026602>
- Sayer, N. A. (2012). Traumatic brain injury and its neuropsychiatric sequelae in war veterans. *Annual Review of Medicine, 63*, 405–419. <http://dx.doi.org/10.1146/annurev-med-061610-154046>
- Seel, R. T., Kreutzer, J. S., Rosenthal, M., Hammond, F. M., Corrigan, J. D., & Black, K. (2003). Depression after traumatic brain injury: A National Institute on Disability and Rehabilitation Research Model Systems multicenter investigation. *Archives of Physical Medicine and Rehabilitation, 84*, 177–184. <http://dx.doi.org/10.1053/apmr.2003.50106>
- Talbot, L. S., Maguen, S., Metzler, T. J., Schmitz, M., McCaslin, S. E., Richards, A., . . . Neylan, T. C. (2014). Cognitive behavioral therapy for insomnia in posttraumatic stress disorder: A randomized controlled trial. *Sleep, 37*, 327–341.
- Walter, K. H., Dickstein, B. D., Barnes, S. M., & Chard, K. M. (2014). Comparing effectiveness of CPT to CPT-C among U.S. veterans in an interdisciplinary residential PTSD/TBI treatment program. *Journal of Traumatic Stress, 27*, 438–445. <http://dx.doi.org/10.1002/jts.21934>
- Wilder Schaaf, K. P., Kreutzer, J. S., Danish, S. J., Pickett, T. C., Rybarczyk, B. D., & Nichols, M. G. (2013). Evaluating the needs of military and veterans' families in a polytrauma setting. *Rehabilitation Psychology, 58*, 106–110. <http://dx.doi.org/10.1037/a0031693>
- Williams, J. M., & Kay, T. M. (Eds.). (1990). *Head injury: A family matter*. Baltimore, MD: Brookes.
- Wolf, G. K., Strom, T. Q., Kehle, S. M., & Eftekhari, A. (2012). A preliminary examination of prolonged exposure therapy with Iraq and Afghanistan veterans with a diagnosis of posttraumatic stress disorder and mild to moderate traumatic brain injury. *The Journal of Head Trauma Rehabilitation, 27*, 26–32. <http://dx.doi.org/10.1097/HTR.0b013e31823cd01f>
- Writer, B. W., & Schillerstrom, J. E. (2009). Psychopharmacological treatment for cognitive impairment in survivors of traumatic brain injury: A critical review. *Journal of Neuropsychiatry and Clinical Neurosciences, 21*, 362–370. <http://dx.doi.org/10.1176/jnp.2009.21.4.362>

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