

Program of Enhanced Psychiatric Services for Patients With Brain Injury and Neuropsychiatric Disturbances: A Proposed Model of Care

Faizi Ahmed, M.D., Kathleen Bechtold, Ph.D., Gwenn Smith, Ph.D., Durga Roy, M.D., Anita Everett, M.D., Vani Rao, M.D.

Neuropsychiatric disturbances associated with brain injury occur frequently and are a common cause of poor quality of life and caregiver burden. These disturbances can disrupt rehabilitation therapies and contribute to functional impairment if they are not appropriately treated. Although some patients can be treated adequately in an outpatient brain injury clinic or rehabilitation clinic, others need a more specialized structured program. Behavioral problems in particular are challenging and often lead to discharge of patients from traditional rehabilitation programs because their behaviors can be disruptive and/or harmful to themselves and others. These patients are often admitted to inpatient general psychiatric units, where they do not receive the comprehensive care they need. In an effort to prevent unnecessary hospitalizations and to provide comprehensive treatment, a community-based, multidisciplinary program was developed to address the physical, cognitive, and psychiatric needs of patients with brain injury. The program is highlighted with two case presentations: (a) a 31-year-old man with severe traumatic brain injury with subsequent cognitive and behavioral symptoms who had improvement in symptoms and quality of life, and (b) a 38-year-old woman with cognitive and mood symptoms after left temporal lobe resection due to medication-refractory epilepsy who had improved mood symptoms and daily life functioning. Brain injury is commonly associated with a host of neuropsychiatric symptoms that wax and wane. There is an urgent need to develop comprehensive programs that can address the multiple needs of this patient population in a community setting.

J Neuropsychiatry Clin Neurosci 2016; 28:147–152; doi: 10.1176/appi.neuropsych.15060147

Neuropsychiatric disturbances after an acquired brain injury are common and can include changes in mood, behavior, and cognitive functioning.¹ Elevated rates of depression, anxiety, mania, psychosis, and disorders of behavioral dyscontrol are consistently found in this population.² Table 1 summarizes the common neuropsychiatric disturbances associated with brain injury and provides a brief overview of the core features and commonly used scales to rate the severity of these problems. Because this study aims to propose an integrative model of care for persons with brain injury experiencing neuropsychiatric disturbances, describing the specific neuropsychiatric disturbances and their management is beyond the scope of this article. Reviews of neuropsychiatric disturbances that are associated with brain injury are available in recently published studies.^{3,4}

Neuropsychiatric disturbances can be exceedingly debilitating, resulting in a profound disruption of daily functioning and prolonged recovery from traumatic brain injury (TBI) and, on occasion, warrant immediate clinical attention. Chronic and disruptive neuropsychiatric disturbances can interfere with rehabilitation and have been associated with unemployment, decreased quality of life, and greater

psychosocial dysfunction.^{5–7} Standard outpatient psychiatric clinics are often unable to provide the regular, intensive clinical monitoring that is required among patients with chronic and/or disruptive neuropsychiatric disturbances associated with brain injury. Similarly, inpatient psychiatric units are often not a practical solution for patients with chronic neuropsychiatric disturbances but should be considered any time there are concerns about imminent danger or safety for the person or others. Other common reasons for inpatient admissions include an acute increase in neuropsychiatric disturbance severity that significantly interferes with daily functioning or failed outpatient care.

Patients living in the community with less severe neuropsychiatric disturbances can be managed in outpatient neuropsychiatric clinics. However, individuals with disruptive behavioral problems such as anger outbursts, aggression, or disinhibition often require more intense treatment than is available in standard outpatient settings. Although more intensive treatment is required, these patients may not require constant (24-hour/7-day) supervision in a psychiatric hospital. Similarly, patients with a newly diagnosed neuropsychiatric disturbance or those with multiple

TABLE 1. Common Neuropsychiatric Disturbances Associated With Brain Injury^a

Neuropsychiatric Disturbance	Core Features	Severity Rating Scales
Aggression	Verbal outbursts, physical harm (hitting, throwing items, breaking items)	Modified Overt Aggression Scale, NPI-C
Anxiety	Nervousness, restlessness, panic attacks, obsessions	NPI-C
Apathy	Disinterest, lack of motivation, absence of emotional responsivity	Apathy Evaluation Scale, NPI-C
Depression	Depressed mood, anhedonia, vegetative signs, cognitive impairment (mainly executive dysfunction)	Patient Health Questionnaire-9, NPI-C
Disinhibition	Impulsivity, inappropriate social behaviors (verbal, physical, or sexual) that are not aggressive	NPI-C
Irritability	Annoyance, loss of temper, impatience, anger	NPI-C, National Taiwan University Irritability Scale
Mania	Elevated or irritable mood, increased energy and psychomotor activity, rapid thinking and speech, decreased need for sleep	NPI-C, Young Mania Rating Scale
Mood lability	Brief bursts of emotional expression in response to a less emotional stimulus	NPI-C, Center for Neurologic Study-Lability Scale
Pathological laughter and crying	Brief bursts of laughter or crying in response to minor emotional or neutral stimuli	NPI-C, Pathological Laughter and Crying Scale
Psychosis	Delusions, hallucinations, disorganized thoughts and behavior	NPI-C, Brief Psychiatric Rating Scale
Sleep disturbances	Insomnia, hypersomnia, sleep apnea, parasomnia	NPI-C, Pittsburgh Sleep Quality Index, Epworth Sleepiness Scale

^a Disturbances are presented in alphabetical order. NPI-C, Neuropsychiatric Inventory–Clinician rating scale.

comorbid psychiatric disturbances may also need more intense management than is available in standard outpatient clinics. A day program that enables multiple visits per week and provides both psychiatric and rehabilitation services would provide an ideal option for many patients with brain injury, concomitant disruptive behavioral problems, and/or multiple neuropsychiatric comorbidities. Importantly, it is widely known that persons with brain injury who have chronic neuropsychiatric disturbances are high utilizers of the health care system in general. A comprehensive outpatient program that regularly monitors these patients and provides enhanced psychiatric services has the potential to reduce admissions, decrease health care costs, and promote recovery and successful re-engagement into the community.

CURRENT CHALLENGES ASSOCIATED WITH MANAGEMENT OF NEUROPSYCHIATRIC DISTURBANCES IN TRADITIONAL OUTPATIENT CLINICS

The majority of traditional brain injury rehabilitation outpatient programs well address the physical, functional, and cognitive impairments. Psychiatric consultations may be part of the standard clinical services, but regular psychiatric treatment is generally not available. More importantly, there is limited availability of individuals with specialized neuropsychiatric expertise to address the mood and behavioral issues that can frequently be associated with brain injury. Consequently, patients with severe behavioral disturbances (e.g., agitation, boundary violations, physical aggression) are often discharged from standard outpatient rehabilitation programs because the behaviors are disruptive and are viewed as interfering with the therapeutic milieu.

Similarly, because of the medical, physical, and cognitive comorbidities among patients with brain injury who present with neuropsychiatric disturbances, general psychiatric outpatient clinics are often not appropriate for these individuals. Many mental health clinicians feel that they are not equipped to manage the complexities of these comorbidities and believe that these patients need a higher level of care than is available in general outpatient psychiatric clinics. Furthermore, although much overlap exists between the wide spectrum of neuropsychiatric disturbances that arise after brain injury and primary psychiatric disorders, traditional psychiatric day program clinicians may be concerned about accepting these patients secondary to their medical issues, such as seizures, gait imbalance, and cognitive impairments. Unfortunately, when it becomes clear that patients with neuropsychiatric disturbances are not having all of their needs met in outpatient mental health programs, all too frequently a decision is made to admit these patients to an inpatient psychiatric program. Although such an admission can be very helpful for an individual with TBI who is in crisis and/or is in need of immediate treatment, a general psychiatry inpatient facility may not be appropriate to address the chronic emotional, cognitive, and behavioral disturbances associated with TBI.

SOLUTION TO OVERCOMING THE CHALLENGES: HOPKINS MODEL

Persons with brain injury and disruptive neuropsychiatric disturbances benefit from a structured program that can address their mood, behavioral problems, and cognitive and functional deficits in a comprehensive and holistic manner. Evaluation and management of neuropsychiatric

disturbances requires a multipronged approach and a multidisciplinary team that includes neuropsychiatrists, neuropsychologists, behavioral therapists, case managers, and medical caregivers, among others.

Realizing that there was an unmet need for such outpatient services at Johns Hopkins, we extended the existing neuropsychiatry brain injury clinic, which is a component of the community psychiatry program, to include a day program that provided enhanced psychiatric services. The neuropsychiatry brain injury clinic is staffed by a neuropsychiatrist, neuropsychiatry fellows, and master's-level mental health therapists. The physicians and therapists work collaboratively; the physicians are solely responsible for pharmacological treatment, and mental health therapists provide individual therapies (i.e., supportive, interpersonal, and/or modified cognitive-behavioral therapies) tailored to the needs of the individual. Education and counseling of family members is also provided on an ongoing basis both by the physicians and therapists. Similar to other outpatient psychiatric programs, after the initial evaluation, patients return to the outpatient clinic for follow-up visits weekly or biweekly in the early treatment period and later, after stabilization of acute psychiatric symptoms, monthly, or every few months.

As above, the services offered in the general outpatient brain injury clinic are often not sufficient for patients with brain injury, chronic neuropsychiatric disturbances, and multiple psychiatric comorbidities. In an effort to provide the new, needed services, we collaborated with two other existing programs: the adult Psychiatric Rehabilitation Program (which is operated also by the Community Psychiatry Program in the Psychiatry Department) and the Brain Rehabilitation Program (in the Department of Physical Medicine and Rehabilitation).

The Psychiatric Rehabilitation Program is for general psychiatric patients who require higher levels of observation and treatment. This program provides a full range of psychiatric rehabilitation services for individuals with chronic mental illness who have moderate to severe functional deficits. Patients attend this program three to five times weekly. Mental health therapists in this program provide various group therapies (e.g., social skills development, anger management training, substance abuse counseling) with the goal of "promoting independent and community living skills and facilitating the individual's rehabilitation and recovery." Other recovery/rehabilitation services, such as supported employment, supported housing, and case management, are provided as needed.

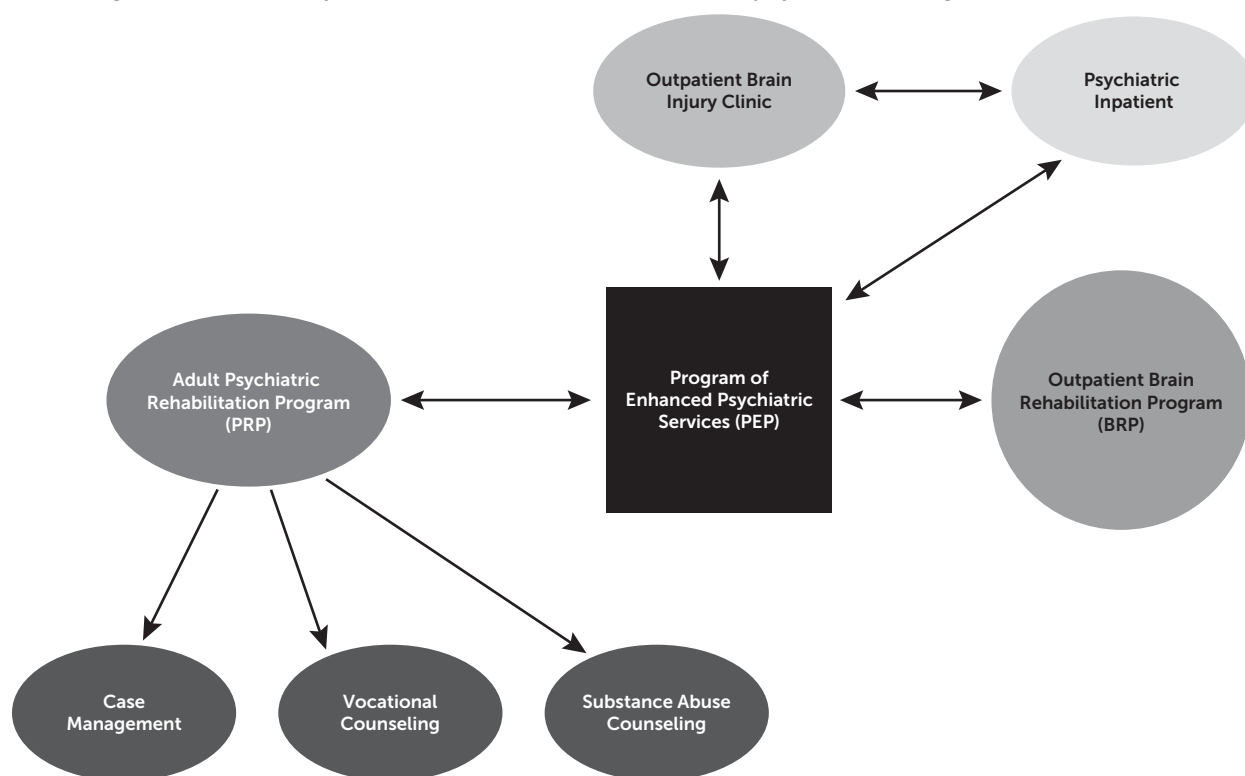
The Brain Rehabilitation Program is directed by a neuropsychologist and provides neurorehabilitation evaluations and interventions using a multimodal treatment paradigm of rehabilitation neuropsychological therapy, behavioral therapy, physical therapy, psychiatric interventions, occupational therapy, speech-language therapy, and cognitive rehabilitation. Specialized evaluations, including neuropsychological evaluations, capacity evaluations, driving evaluations, and return-to-work evaluations, are provided within the Brain Rehabilitation

Program. The main goal of this program is to facilitate patients re-engaging fully in life activities in the community that they find meaningful by promoting recovery, adaptation, and adjustment after brain injury.

Integrating the services of these two programs into the outpatient psychiatric brain injury clinic has helped us to develop a brain injury outpatient psychiatric program that addresses the complex needs of patients with TBI and neuropsychiatric disturbances. The new program, named the Program of Enhanced Psychiatric Services (PEP), serves as a step up from the outpatient clinic and a step down from an inpatient psychiatric unit (Figure 1). The PEP services aim to (a) promote successful community reintegration, (b) achieve rapid mood and behavioral stabilization in a safe and controlled environment, (c) reduce hospitalizations, and (d) reduce visits to emergency rooms. Patients enrolled in PEP are assessed and evaluated by clinicians in the neuropsychiatry brain injury clinic, the adult Psychiatric Rehabilitation Program, and the Brain Rehabilitation Program depending on the needs of the individual.

Patients enrolled in PEP services are seen regularly by neuropsychiatrists (trained or in training) for medical evaluation and pharmacological management. The frequency of attendance depends on the severity of the illness and can range from two to three times weekly to once every 2 weeks. In addition, all patients also receive individual and group psychotherapy. Therapists from the neuropsychiatry brain injury clinic provide supportive therapy (with a focus on brain injury education), interpersonal therapy (with a focus on maintaining or improving relationships with family members or caregivers), and/or behavioral therapies (with a focus on changing behavior and not acting on feelings). Group therapies are led by therapists from the adult Psychiatric Rehabilitation Program. Activities within group therapies include presentations, discussions, quizzes, and games, which are all intended to enhance communication skills, improve self-esteem, and promote development of anger management skills and behavioral control skills. Groups also include self-discovery and problem-solving activities, mindfulness training, and recreational therapy.

Within PEP services, multidisciplinary team meetings are held weekly, and an individual treatment plan is tailored for each patient based on his or her needs. Family meetings are held as needed to ensure clear communication of the treatment plan among the patient, family, and providers. Integrating family members and/or key caregivers is a key element of PEP services, and these individuals frequently attend therapy activities and are trained to appropriately assist and support the patient at home and in the community. Over time, update assessments are conducted within the PEP services in order to refine goals to address the evolving needs of the individual. The focus of PEP interventions is to support recovery and skill development to promote successful community integration. We have found this combination of services particularly effective in treating persons with brain injury and moderate to severe neuropsychiatric

FIGURE 1. Program of Enhanced Psychiatric Services for Persons With Brain Injury: Model of Integrated Care^a

^a BRP, Brain Rehabilitation Program; PEP, Program of Enhanced Psychiatric Services; PRP, Psychiatric Rehabilitation Program.

disturbances. Arciniegas and Wortzel⁸ previously described the importance of symptom-specific treatments including pharmacological and nonpharmacological therapies for management of disruptive neuropsychiatric disturbances. Our approach incorporates a similar regimen of treatment modalities and has been shown to have a broad-ranging clinical benefit.

CASE REPORTS

Both of the following cases exemplify the many types of neuropsychiatric problems associated with brain injury and the importance of developing an individualized but multifaceted treatment approach. Their varying pathology illustrates how a comprehensive program allows for individually tailored treatment plans. We have purposely chosen not to discuss the details of pharmacological and nonpharmacological treatment, because the goal of these case reports is to highlight the importance of collaborative care and the need for intense treatment among persons with brain injury and chronic neuropsychiatric disturbances. Both patients were initially evaluated in the neuropsychiatry brain injury clinic and were identified as needing PEP services. With successful intervention in this program, the patients continued to be monitored in the neuropsychiatry brain injury clinic.

Case 1

A 31-year-old man, who had sustained a severe brain injury at age 24 years when he was involved in a pedestrian-related

motor vehicle accident, was transferred to our program from a general outpatient psychiatric clinic for management of major depression and verbal aggression. Symptoms included frequent bouts of yelling, with seemingly little provocation, at his mother, neighbors, and others in the community. His medical history was significant for posttraumatic epilepsy, which was well controlled with a combination of antiepileptic medications. The patient's medical workup was normal except for CT findings of multiple bilateral frontal and left parieto-occipital lesions. His Montreal Cognitive Assessment score was 20/30. He had a preinjury history of attention deficit hyperactivity disorder, which was diagnosed and treated only while he was in elementary school. The patient's social history was notable for having dropped out of an alternative high school for behavioral problems and obtaining a General Equivalency Diploma at age 20 years. He married at age 24 years before the injury and divorced 4 years later, when he moved back to his mother's home. He had a 7-year-old daughter from a previous relationship, who was being cared for by her mother. His daughter visited him regularly. Although he enjoyed spending time with his daughter, he was easily irritated and had "snapped" at her over trivial issues, which frightened her.

The patient was enrolled in PEP services, which he attended 3 days per week for 10 weeks. He received pharmacological treatment from a neuropsychiatrist and individual psychotherapy, including supportive and modified cognitive-behavioral therapy from a mental health therapist.

In addition, he also participated in multiple group therapies co-led by therapists from the adult Psychiatric Rehabilitation Program and the neuropsychiatry brain injury clinic. These included sessions that focused on mindfulness, anger management, and enhancement of social and life skills. Therapies focused on management of impulsivity, healthy emotional expression, and establishment and maintenance of predictability and routine in daily life.

At the end of 10 weeks, the patient's symptoms of depression were in remission and his behavioral symptoms of impulsivity and verbal aggression had also decreased in intensity and frequency. Interactions with his mother and neighbors were less tense and more enjoyable to the patient. His visits with his daughter were also more enjoyable, and she was less fearful of him.

This patient's progress exemplifies the importance of specialty daily program treatment for patients with brain injury, because his behavioral symptoms would likely have been cause for discharge from a traditional psychiatric day program. The addition of the Psychiatric Rehabilitation Program to his treatment in the neuropsychiatry clinic was a key factor in his recovery. Our staff, experienced in managing behavioral symptoms resulting from brain injuries, kept him engaged in our program with positive results.

Case 2

A 38-year-old woman was diagnosed with complex partial seizures with secondary generalization at age 19 years. She began experiencing symptoms of depression at that time. She also had a family history of depression and a history of daily marijuana use for 3 years before the onset of epilepsy at age 19 years. The patient graduated from high school with average grades and had lived with her mother, who was her primary caretaker, throughout her life.

At ages 20 and 24 years, the patient underwent left temporal lobe resections for medication-refractory epilepsy. After the surgeries, she experienced significant cognitive difficulties and worsening bouts of major depression with psychotic features, predominantly auditory hallucinations. In addition, she also had frequent bouts of anger and irritability that were associated with threats of self-injurious behaviors, such as threatening suicide by cutting herself with a knife. These episodes were often triggered by real or perceived negative interactions with her mother and had led to several psychiatric hospitalizations.

The patient presented to the neuropsychiatry brain injury clinic after being referred by her epileptologist for further management of depression. After evaluation, she was transferred to PEP services for more intensive treatment. Services included engagement in neurorehabilitation services within the Brain Rehabilitation Program, with the focus on improving life management skills and addressing her cognitive impairments. After her evaluations, the patient engaged in PEP services three times per week on average. Treatment modalities included pharmacological treatment of her affective disorder by a neuropsychiatrist, individual

supportive therapy by a mental health therapist from the brain injury clinic, group therapies providing guidance for problem solving and strategies to reduce impulsive behaviors, and cognitive and functional rehabilitation from Brain Rehabilitation Program staff.

During the course of engaging in services, the patient's major depression with psychotic symptoms improved significantly. She also showed improvement in her level of independence in life management tasks, such as cooking and doing laundry. She learned to use an iPad tablet computer as an external memory aid for daily planning and task management. However, her brief dysphoric episodes continued to persist; she was admitted to the inpatient psychiatric unit after one such episode, which was associated with threatening suicide by cutting her wrists with a knife. In addition to minor medication adjustment, the inpatient unit staff—in collaboration with the patient and her mother—worked to find an appropriate assisted-living facility because her dysphoric episodes were often triggered by her negative interactions with her mother. Since her move to the assisted-living facility, this patient has not had an emergency room visit or inpatient hospitalization. This case highlights the multidisciplinary approach in managing individuals with brain injury and neuropsychiatric disturbances and underscores the point that sometimes, despite best efforts to provide care in an outpatient setting, hospitalizations may have to occur when safety is compromised.

Both of these cases exemplify the types of neuropsychiatric problems that patients with brain injury experience and the potential benefits that can be gained from using an individualized but multifaceted approach. Each provider and treatment modality plays a specific role in improving the individual's overall functioning. It is important to note that although one goal of PEP services is remission of the neuropsychiatric disturbances, it is not uncommon for these disturbances to persist in individuals with brain injury. In these cases, decreasing the frequency, intensity, and life impact of neuropsychiatric disturbances becomes the primary objective.

We continue to develop the approach and services provided within PEP. A weakness of PEP services is that the neuropsychiatric brain injury clinic is geographically separated from the neurorehabilitation outpatient program, making it very challenging for patients to attend both of these clinics on the same day. In the future, we hope to provide all services in one location and to make such services more convenient.

CONCLUSIONS

After brain injury, patients with neuropsychiatric disturbances benefit from enhanced psychiatric services, including neuropsychiatric care, individual and group therapies, and neurorehabilitation. Addressing all domains of impairment within a comprehensive program maximizes rehabilitation potential and facilitates true community integration of the individual with brain injury. It is critical that these individuals receive services that address neuropsychiatric disturbances

that are disrupting their engagement in healthy relationships and daily life activities. At this stage, it is unknown whether development of specialized day programs will lead to increased referrals of patients with brain injury from traditional psychiatric outpatient clinics. Controlled studies are required to assess both the financial viability and the clinical effectiveness of our treatment program compared with other levels of care and programs that do not offer the same array of services. Financial viability is a crucial factor in the formation of new programs. Further exploration is required to compare our program's costs with other payment models, including billing per patient admission into the program (i.e., day program model) instead of billing based on the specific services used (i.e., fee-for-service model).

The main short-term measures to assess clinical effectiveness will require tracking of emergency department visits, hospitalizations, and length of stay during hospitalizations. In the long term, we aim to track longitudinal assessments using standardized scales to assess neuropsychiatric outcomes. This type of tracking and monitoring can also lay the groundwork for determining early prognostic markers for neuropsychiatric morbidity. We recommend the use of the Neuropsychiatric Inventory–Clinician rating scale, which allows the clinician to obtain and incorporate caregiver and patient information into the rating for a comprehensive evaluation of neuropsychiatric disturbances.⁹ Although this tool is not yet validated in patients with brain injury, we have found it useful in assessing and tracking changes in neuropsychiatric disturbances.

In the future, we also plan to integrate PEP services with acute care services so that persons with brain injury being discharged from neurointensive care services and/or inpatient neurorehabilitation services can be admitted to our program for postacute care. Patients will then be able to receive a full range of care within a coordinated system, with the goal of preventing development of maladaptive behaviors along with promoting recovery, adaptation, and adjustment.

In summary, we hope that the formation of PEP services for persons with brain injury will provide a patient-centered, cost-effective, and clinically superior solution for these underserved persons.

AUTHOR AND ARTICLE INFORMATION

From the Depts. of Psychiatry and Behavioral Sciences (FA, GS, DR, AE, VR) and Physical Medicine and Rehabilitation, Johns Hopkins University School of Medicine, Baltimore (KB).

Send correspondence to Dr. Ahmed; e-mail: fahmed18@jhmi.edu

The authors report no financial relationships with commercial interests.

Received June 17, 2015; revised Oct. 20, 2015; accepted Oct. 25, 2015.

REFERENCES

1. Rao V, Lyketsos C: Neuropsychiatric sequelae of traumatic brain injury. *Psychosomatics* 2000; 41:95–103
2. Orlovská S, Pedersen MS, Benros ME, et al: Head injury as risk factor for psychiatric disorders: a nationwide register-based follow-up study of 113,906 persons with head injury. *Am J Psychiatry* 2014; 171:463–469
3. Rao V, Koliatsos V, Ahmed F, et al: Neuropsychiatric disturbances associated with traumatic brain injury: a practical approach to evaluation and management. *Semin Neurol* 2015; 35:64–82
4. Jorge RE, Arciniegas DB: Neuropsychiatry of traumatic brain injury. *Psychiatr Clin North Am* 2014; 37:xi–xv
5. Rao V, Spiro JR, Handel S, et al: Clinical correlates of personality changes associated with traumatic brain injury. *J Neuropsychiatry Clin Neurosci* 2008; 20:118–119
6. Rapoport MJ, McCullagh S, Streiner D, et al: The clinical significance of major depression following mild traumatic brain injury. *Psychosomatics* 2003; 44:31–37
7. Warriner EM, Velikonja D: Psychiatric disturbances after traumatic brain injury: neurobehavioral and personality changes. *Curr Psychiatry Rep* 2006; 8:73–80
8. Arciniegas DB, Wortzel HS: Emotional and behavioral dyscontrol after traumatic brain injury. *Psychiatr Clin North Am* 2014; 37: 31–53
9. de Medeiros K, Robert P, Gauthier S, et al: The Neuropsychiatric Inventory–Clinician rating scale (NPI-C): reliability and validity of a revised assessment of neuropsychiatric symptoms in dementia. *Int Psychogeriatr* 2010; 22:984–994