



Original Research

Interdisciplinary Rehabilitation Referrals in a Concussion Clinic Cohort: An Exploratory Analysis

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Abstract

Objective: To assess the frequency and spectrum of referrals to rehabilitation disciplines in a concussion clinic population and factors associated with need for referral.

Design: Retrospective study.

Setting: Concussion clinic within the Physical Medicine and Rehabilitation Department of an academic medical center.

Participants: Patients receiving psychiatric management for concussion care.

Main Outcome Measures: Referral to physical therapy (PT), occupational therapy, speech therapy (ST), neuropsychology, or any referral (Any), and reasons for referral.

Interventions: Demographic and clinical variables were analyzed for possible association with referral to rehabilitation disciplines. These independent variables included mechanism of injury, referral source, age, gender, provider, days since injury, presenting Sports Concussion Assessment Tool 2 (SCAT2) symptom score, insurance type, clinical risk factors, whether the injury was work related and whether the patient had been hospitalized.

Results: Among 262 patients meeting inclusion criteria, the most commonly prescribed individual therapy was physical therapy (74 patients; 28%), followed by speech therapy (60 patients, 23%), neuropsychology (27 patients, 10.3%), and occupational therapy (19 patients, 7.2%). In all, 121 (46%) of patients were referred to one or more disciplines. The most common reasons for referral were cognitive strategies (54 patients, 21%), balance/vestibular therapy (50 patients, 19%), and neck pain (32 patients, 12%). Per multivariate logistic regression analysis, covariates associated with PT: age, SCAT2 symptom score, gender, provider, and (inversely) cognitive/learning disorder; ST: time elapsed since injury, gender, and referral source of internal clinic; Any: SCAT2 symptom score. Referrals did not significantly vary by mechanism of injury (sports, fall, vehicular, etc), whether work-related, or whether the patient had been hospitalized. Insurance factors were significant for PT and Any on the univariate analysis but not logistic regression.

Conclusions: Relatively little has been described about the typical rehabilitation requirements of individuals recovering from concussion. Although rest and guided return to usual activities have been emphasized as mainstays of management, a large number of patients in this concussion cohort were determined to require additional rehabilitation services to assist in recovery.

Introduction

Although it has been suggested that a difference exists between concussion and other mild brain injuries, with concussion on the mildest end of the spectrum [1], specific distinctions have not been clearly established, nor has there been agreement on a specific time frame for labeling persisting sequelae as postconcussion syndrome [2,3]. Intensive rehabilitation constitutes usual care for severe brain injury, but the conventional paradigm for concussion management emphasizes early recognition, rest, and surveillance, with progressively guided return to

usual activities [1,4]. The rationale for physical and cognitive rest is based on acute metabolic and vascular stresses, which require time to stabilize and potentially are worsened by the increased energy demands of exercise and other activities [5]. No definite benefit of rest, however, has been found beyond the initial 10-day period [6]. In addition, some concussion patients exhibit longer-term manifestations of their injury, failing the "rest" paradigm.

Benefits of subthreshold aerobic exercise are emerging [7,8], and vestibular rehabilitation is also a well-recognized need [9]. In a review of literature to

date, Leddy et al [2] cite overall level B evidence for early education, cognitive-behavioral therapy, and aerobic exercise therapy in aiding concussion recovery. There is also recognition that some populations, such as injured workers, may have contextual-related issues that affect care and recovery [10], such that tincture of time may be insufficient in maximizing outcomes.

Despite identified risk factors for prolonged concussion recovery [1], the emerging benefits of active rehabilitation therapy, and increased recent attention to concussion prevention, recognition, and management in general, little has been described about the actual rehabilitation service delivery needs of this population. Such a landscape can be used to provide insights against which future models of care and outcome studies can be developed. This study will examine referral patterns to various rehabilitation disciplines in a concussion clinic, including assessment of potential underlying predictive factors.

Methods

Individuals seen for concussion care between December 2011 and December 2013 were included. The clinic is set within the Physical Medicine and Rehabilitation Department at an academic medical center which is also a county hospital and a level I trauma center.

Exclusion criteria included history of intracranial bleeding occurring with the injury, insufficient information, or nontraumatic etiology. Those with extracranial head bleeding or fractures could be included. Injury severity parameters such as initial Glasgow Coma Score or posttraumatic amnesia duration, which would not have been reliably obtainable in many cases, were not used in subject selection. For the purposes of this study, the term concussion can be considered as interchangeable with mild traumatic brain injury (mTBI), except that we excluded those patients with brain bleeds, which some might include within the mTBI category if other criteria are met, ie, so-called "complex mild" cases [11].

Underlying demographic variables were collected, including age, gender, mechanism of injury, referral source, date of injury, date initially seen in our clinic, whether the patient was hospitalized, and clinical risk factors, including history of past concussion, migraines, and psychiatric or learning or cognitive issues. If a patient had more than one concussion, the first one that was considered relevant to the recent course was used as the date of injury. We noted which of our 2 main physician providers saw the patient. Because economic factors have been found to have an effect on brain injury recovery, especially in the setting of mTBI [12], we collected data on type of insurance (commercial, Medicaid, Medicare, Worker's Compensation, none or other/unknown).

Mechanism of injury was categorized as sports/recreation, motor vehicle collision (MVC), falling object on head, assault, fall, or other/unknown. When an injury related to more than one category, it was classified in the more specific situational context. For example, an assault-related fall would be classified as assault, and an instance of an object falling on head during a sports activity would be classified as sports-related. Work-related injury was assessed separately.

Referral sources included the emergency department (ED), trauma service after brief hospitalization, same institution clinic (such as family practice, neurology, trauma, neurosurgery, etc), external referral, or other. Patients referred by more than one source were classified in the more acute domain. For example, trauma service hospitalization took precedence over ED, and ED took precedence over an outpatient clinic setting, in assignments for this category.

Because the symptom profile from the Sports Concussion Assessment Tool 2 (SCAT2; range, 0-132) [13] score routinely is collected, the value from the initial visit was included.

Referrals to physical therapy (PT), occupational therapy (OT), speech therapy (ST), and neuropsychology (NP) were recorded, including the reason(s) for referral, and the number of sessions the patient received.

The institution's electronic medical record system facilitated data capture, including referrals entered over time. This study was approved by the Institutional Review Board of the home institution.

Statistical Analysis

Descriptive information was compiled of the demographic mix of the population and the overall characteristics of the referrals. Next, univariate analysis was performed for categories which were binary (gender, provider, hospitalization, work-related, clinical risk factors) or continuous (age, initial SCAT2 score, and time in days between injury and initial concussion clinic visit), to identify which factors were associated most strongly with referral to the various rehabilitation sectors. χ^2 analysis was used for the binary variables and Mann-Whitney Rank Sum tests for continuous variables. χ^2 analysis with multiple categories was performed for the nominal variables with multiple subcategories (injury mechanism, referral source, insurance). Separate analyses were performed for each discipline as dependent variables, as well as a combined category which included patients that had been referred to any discipline (Any). Any missing data items for a particular subject were entered as negative (ie, no past concussion, SCAT symptom score zero, etc). Multivariate logistic regression analysis (SigmaPlot) was then performed to identify predictors associated with the outcomes for each of the individual disciplines and for Any while controlling for other key covariates, including reporting

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