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### **ORIGINAL RESEARCH**

## Institutional Variation in Traumatic Brain Injury Acute Rehabilitation Practice



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#### Abstract

**Objective:** To describe institutional variation in traumatic brain injury (TBI) inpatient rehabilitation program characteristics and evaluate to what extent patient factors and center effects explain how TBI inpatient rehabilitation services are delivered.

Design: Secondary analysis of a prospective, multicenter, cohort database.

Setting: TBI inpatient rehabilitation programs.

Participants: Patients with complicated mild, moderate, or severe TBI (N=2130).

Interventions: Not applicable.

Main Outcome Measures: Mean minutes; number of treatment activities; use of groups in occupational therapy, physical therapy, speech therapy, therapeutic recreation, and psychology inpatient rehabilitation sessions; and weekly hours of treatment.

**Results:** A wide variation was observed between the 10 TBI programs, including census size, referral flow, payer mix, number of dedicated beds, clinician experience, and patient characteristics. At the centers with the longest weekday therapy sessions, the average session durations were 41.5 to 52.2 minutes. At centers with the shortest weekday sessions, the average session durations were approximately 30 minutes. The centers with the highest mean total weekday hours of occupational, physical, and speech therapies delivered twice as much therapy as the lowest center. Ordinary least-squares regression modeling found that center effects explained substantially more variance than patient factors for duration of therapy sessions, number of activities administered per session, use of group therapy, and amount of psychological services provided.

**Conclusions:** This study provides preliminary evidence that there is significant institutional variation in rehabilitation practice and that center effects play a stronger role than patient factors in determining how TBI inpatient rehabilitation is delivered.

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Traumatic brain injury (TBI) inpatient rehabilitation (IR) providers are increasingly challenged to deliver high value services that optimize patient outcomes relative to costs. Across medical

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fields, patient-centered care and evidence-based practice are viewed as key processes to improve the quality, efficiency, and effectiveness of health care.<sup>1-4</sup> Patient-centered care in the IR context focuses on being responsive to patients' holistic needs, including taking into account patients' preferences and health care needs relative to injury severity, functional impairment, and ability and matching treatments to patients' goal and desired outcomes. Interdisciplinary rehabilitation that includes physiatry, nursing, physical therapy (PT), occupational therapy (OT), speech therapy

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(ST), psychology/neuropsychology, case management, therapeutic recreation, and access to a wide array of medical specialists provides the expertise to treat the whole patient. Being responsive to patients' preferences, values, and needs, however, can be a daunting venture because of the severe cognitive impairments of patients with TBI that limit their ability to both understand their situations and communicate personal needs. The heterogeneity of the TBI population also presents significant challenges, which require balancing patient-centered, personalized treatment across all cases with efficiently and effectively managing day-to-day rehabilitation service logistics.

To promote high value health care and optimize patient outcomes across providers, accrediting organizations define rehabilitation service delivery standards for specialized brain injury programs. A consultative, accreditation process evaluates the medical rehabilitation center's (1) commitment, capabilities, and resources dedicated to delivering appropriate service intensity, frequency, and variety; (2) personnel skills and competencies; and (3) continuous improvement processes in which program evaluation data and research evidence are used to assure effective, high value rehabilitation services.<sup>5</sup>

Despite the accreditation-, economic-, and consumer-driven impetus for evidence-based, patient-centered, high value care, there has been little published research describing TBI rehabilitation practice delivery. The Uniform Data System for Medical Rehabilitation National Database and the TBI Model Systems National Database have been used to summarize and benchmark data on IR facility characteristics (eg, patient sociodemographics, severity/case mix) and patient outcomes, including length of stay (LOS), functional status, rates of improvement, and discharge setting.<sup>6-11</sup> In addition, variations in TBI IR program adherence to quality of care indicators have been described related to general medical, cognitive and motor function, neuropsychological and social outcomes, and family- and community-centered outcomes.<sup>12</sup>

Little research has been published describing how TBI rehabilitation units are staffed (eg, nursing ratios per patient per shift, clinicians' level of experience providing services to persons with TBI). Little has been published on the duration, frequency, and number of activities used during IR therapy sessions and the delivery of group and weekend treatment sessions. Further, there has been virtually no examination of the relative contribution of primary patient prognostic factors (eg, age, severity, time postinjury) versus centers' practice preferences that explain TBI IR variations in service delivery.

To address this lack of research, our study has 3 primary goals. First, we describe variation in the program characteristics of the 10 participating rehabilitation centers in the TBI–Practice Based Evidence (TBI-PBE) study, including acute referral locations, payer mix, provider specialties and staffing mix, specialized programs, participation as a training site by discipline, clinician

#### List of abbreviations:

CSI	Comprehensive Severity Index
IR	inpatient rehabilitation
LOS	length of stay
ОТ	occupational therapy
PT	physical therapy
ST	speech therapy
TBI	traumatic brain injury
TBI-PBE	Traumatic Brain Injury-Practice Based Evidence

experience, and patient characteristics related to age, severity, function, and time (eg, postinjury, LOS). Second, we present data on institutional variation in TBI IR service delivery for 3 core disciplines (PT, OT, ST) that describe variations in minutes per session, activities per session, use of group therapies, and weekly hours of treatment delivered during the week and on weekends. We also present data on psychological and therapeutic recreation services delivered. Finally, we evaluate the extent that variations in selected TBI IR service delivery dynamics are explained by patient factors versus center effects that likely reflect institutional preferences.

#### Methods

#### **Design and participants**

This article is a secondary analysis of data from a prospective, multicenter, comparative effectiveness study in which patient characteristics, environmental factors, and interventions were evaluated to identify factors that were associated with key TBI IR outcomes.<sup>13</sup> A cohort of 2130 persons aged  $\geq$ 14 years who sustained complicated moderate or severe TBI were enrolled between October 2008 to August 2011 from 10 IR centers located in the United States or Canada.<sup>13</sup> The 10 rehabilitation centers selected to participate in the TBI-PBE study expressed a strong interest in this intensive observational, data collection effort; demonstrated a strong hospital and TBI administration commitment to conducting the study; and possessed the operational infrastructure to train and commit all staff to data collection. Further details about procedures and enrollment rates have been published elsewhere.<sup>13</sup> The institutional review board of each site approved the study protocol, and patients who sustained a TBI or their authorized proxy provided informed consent prior to data collection.

#### Measures

The program characteristics of the 10 TBI-PBE study rehabilitation centers were collected primarily using a standardized facility survey form. The lead investigator at each site collected the following data: whether the facility was a freestanding or hospitalbased center; the number of beds; the number of beds dedicated to brain injury; the primary attending physician specialties; whether the facility used nurse practitioners and physician assistants; whether the facility was a training site for residents and students for each interdisciplinary specialty; the typical length of rotation for residents/students in each specialty; whether the facility had a specialized disorders of consciousness program; whether the facility had a formal peer mentoring program; whether the facility had state vocational rehabilitation agency staff on-site; whether the facility used 8- or 12-hour nursing shifts; and the number of registered nurses, licensed professional nurses, and nurse aides/ technicians per patient and per shift. Trained data abstractors at each site collected data on patients' referring acute care locations and primary health insurance payers.

With regard to clinician experience, each OT, PT, ST, psychology, social work or case management, and therapeutic recreation staff member at each study center reported the number of years he/she had worked in TBI rehabilitation using a standardized clinician profile form. A clinician experience index was then created for each patient based on the average level of TBI Download English Version:

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