Cognitive Rehabilitation Services Following Diffuse and Focal Traumatic Brain Injuries: A TriNetX Analysis

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Introduction

Traumatic brain injury (TBI) occurs when an external force causes an injury to the brain (NINDS, n.d.). It affects millions of Americans every year (Waltzman et al., 2025).

The damage caused by TBI may be confined to a specific area (e.g., subdural hematoma) of the brain or widespread (e.g., diffuse cerebral edema) affecting multiple areas of the brain. The former is referred to as focal TBI whereas the latter is referred as diffuse TBI (Johns Hopkins, n.d).

Cognitive impairments are common among patients with traumatic brain injury, and they present differently in those who are diagnosed with diffuse and focal TBI.

Aim & Methods

The aim is to determine what percentage of patients diagnosed with diffuse and focal TBI received cognitive rehabilitation and identify which group received cognitive rehabilitation the most, using TriNetX database, a global health research Network.

This retrospective study was a secondary analysis of existing data and does not involve or interaction with human subjects and is de-identified per section § 164.514(a) of the HIPAA Privacy Rule and hence exempt from IRB.

US Collaborative Network was searched on March 6, 2026, using ICD 10 diagnostic codes for diffuse and focal TBI.

Both cohorts were further analyzed by cognitive rehabilitation CPT codes (97129 and 97130). The dates of CPT codes must have occurred after the date of diagnoses.

All statistical analyses were performed through the TriNetX platform. No propensity score matching was done due to the similarity of patient characteristics in both groups.

Results

The study population consisted of 157798 patients with either diffuse or focal TBI, between January 2016 and December 2025 from the TriNetX database. Of these patients, 51319 (32.52%) were diagnosed with diffuse TBI and 106479 (67.48%) were diagnosed with focal TBI .

In the diffuse TBI cohort, 68% were men and 32% were women. The average age of patients was 56 years with the largest number of patients in 27-36 years and 60-68 years age groups.

In the Focal TBI cohort, 65% were men and 35% were women. The average age of patients was 62 years, with the largest number of patients in the 60 to 90 years age group.

Only 5.56% (n=2856) of patients with diffuse TBI and 4.70% (n=5003) of patients with focal TBI received cognitive rehabilitation services.

In the diffuse TBI cohort, the largest group of patients who received cognitive rehabilitation services were in the 25-45 years age group.

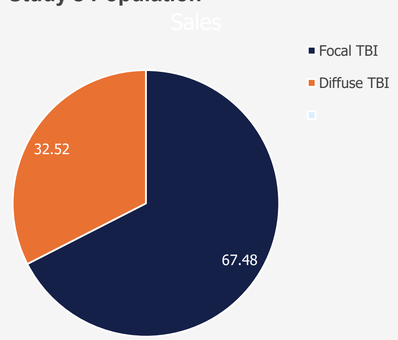
In the focal TBI group, the largest group of patients who received cognitive rehabilitation services were in the 60-70 years age group.

The comparative analyses for CPT code 97130, which represents each additional 15 minutes of one-on-one therapeutic cognitive function intervention, were significant (P value <0.0002; standard difference 0.0866). This indicates that patients with diffuse TBI received longer duration of cognitive rehabilitation services compared to that of patients with focal TBI.

Table 1. Baseline Cohort Characteristics

	Cohort 1 – Diffuse TBI with Cognitive Rehabilitation (n=2856)	Cohort 2 - Focal TBI with Cognitive Rehabilitation (n=5003)
Age (mean, SD)	50.7 (19.1)	56.5 (19.3)
Male (%)	75.04	70.97
Female (%)	24.96	28.98
White %	69.78	70.23
Black or African American (%)	14.91	14.91
American Indian or Native American (%)	0.35	0.34
Native Hawaiian or Pacific Islander (%)	1.12	1.32
Asian (%)	3.36	3.94
Unknown/other Race	10.49	9.26
Hispanic or Latino (%)	11.8	10.25
Not Hispanic or Latino (%)	78.89	79.54
Unknown Ethnicity	9.31	10.21

Figure 1. Focal vs Diffuse TBI in the Study's Population



Conclusion & Implications

Only around 5% percentage of patients with diffuse or focal TBI received cognitive rehabilitation.

Younger patients received more cognitive rehabilitation services compared to their older counterparts.

TBI rehabilitation appears to be more focused more on physical recovery. More advocacy is needed for cognitive rehabilitation services.

Several factors such as severity of injury, accessibility to cognitive care, insurance coverage, provider awareness, and patient specific factors may limit referrals to and delivery of cognitive rehabilitation services following TBI.

Further exploration is needed to identify and address the systemic facilitators and barriers to cognitive rehabilitation following TBI.

References

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