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Longitudinal Trends in Severe Traumatic Brain Injury Inpatient Rehabilitation

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Abstract

Objective: The goal of this study is to describe national trends in inpatient rehabilitation facility (IRF) discharges for the most severely disabled cohort of patients with traumatic brain injury (TBI).

Methods: Data from the Uniform Data System for Medical Rehabilitation for patients discharged from an IRF between January 1, 2002 and December 31, 2017 with a diagnosis of TBI and an admission Functional Independence Measure (FIM) of 18, the lowest possible score, was obtained and analyzed.

Results: Of the 252,112 patients with TBI discharged during the study period, 10,098 met the study criteria. From 2002 to 2017 the number of patients with an IRF admission FIM of 18 following TBI discharged from IRFs annually decreased from 649 to 488, modeled by a negative regression [coefficient = −2.97; p = 0.001] and the mean age (sd) increased from 43.0 (21.0) to 53.7 (21.3) years [coefficient = 0.70; p < 0.001]. During the study period, the number of patients with the most severe disability on admission to IRF who were discharged annually as a proportion

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of total patients with TBI decreased from 5.5% to 2.5% [odds ratio = 0.95; $p < 0.001$] and their mean length of stay decreased from 41.5 (36.2) to 29.3 (24.9) days [coefficient = −0.83; $p < 0.001$].

Conclusion: The number and proportion of patients with the most severe disability on IRF admission following TBI who are discharged from IRFs is decreasing over time. This may represent a combination of primary prevention, early mortality due to withdrawal of life-sustaining treatment, alternative discharge dispositions, or changes in admitting and reimbursement practices. Furthermore, there has been a decrease in the duration of IRF level care for these individuals, which could ultimately lead to poorer functional outcomes, particularly given the importance of specialized rehabilitative care in this population.

Keywords

brain injuries; traumatic; database; length of stay; rehabilitation hospitals

Introduction

While earlier studies have sought to describe inpatient rehabilitation admissions trends in the traumatic brain injury (TBI) population, they have not examined these trends across different levels of injury severity.[1,2] One notable subgroup is those with severe disability following TBI, which includes patients with disorders of consciousness (DoC). This group is at increased at risk for poor outcome without access to appropriate specialized care from a multidisciplinary rehabilitation team.[3,4] We hypothesized that since there have been major changes in the population of patients with TBI admitted to inpatient rehabilitation facilities (IRFs), the current utilization of rehabilitation services for the most severely disabled patients with TBI may not align with the most recent clinical practice recommendations.

Limited access to rehabilitation care for the most severely disabled patients with TBI could compromise the potential to achieve the best possible outcome and undermine research efforts to improve prognostication and treatment. One study of 484 patients with moderate to severe TBI (sTBI) found that for the sTBI group, many made significant functional gains over the course of one year. While at 2 weeks post-injury only 12.4% had a favorable outcome (defined as the ability to remain unsupervised for at least 8 hours a day), this number increased to 52.4% by 12 months.[5] Another study of over 17,000 patients who were admitted to IRFs following a moderate or severe TBI found that 82% of those with a DoC on admission regained consciousness during their rehabilitation stay.[6] Additional studies examining long-term outcomes of patients with DoC have found that 20–53% of patients achieve independence in the home by 5 years, with approximately 20% able to return to work at that time and even more individuals achieving independence by 10 years post-injury.[7,8] These findings suggest that many individuals with sTBI and DoC have the ability to make gains several years after their injury and ultimately recover significant function.

There have been major shifts in reimbursement for patients admitted to IRFs following TBI, including a shift towards Medicare and away from commercial insurers, and shorter lengths of stay (LOS), based on data from 2002 to 2016.[1] A recent study of patients admitted to IRFs after sustaining a TBI reported an increase in mean age from 54.1 to 64.8 years.[1]

There have also been shifts in the mechanism of injury, with falls accounting for a growing proportion of head injuries in the United States and Europe.[9,10]

The Uniform Data System for Medical Rehabilitation (UDSMR) maintains a database containing demographics, medical characteristics, and rehabilitation outcomes for over 70% of IRFs in the United States. It is a valuable resource for rehabilitation outcomes research for a variety of diagnoses, including TBI.[1,11] Though the UDSMR lacks injury severity information such as initial Glasgow Coma Scale score and days of post traumatic amnesia, it contains functional data including the Functional Independence Measure (FIM), which is an indicator of level of disability. The goal of this study was to use the UDSMR database to examine, over a 16-year period, national trends in IRF admissions for patients with the most severe disability following a TBI. We also sought to characterize changes in demographics, medical characteristics, and discharge metrics for this population.

Methods

Participants

Patients in the UDSMR data repository who were discharged between January 1, 2002 and December 31, 2017, with a Rehabilitation Impairment Code of 2.21 (traumatic brain dysfunction, open injury) or 2.22 (traumatic brain dysfunction, closed injury) and an IRF admission FIM of 18, the lowest possible score, were included in the study. Patients <18 years of age were excluded. Patients who died at the IRF or left against medical advice were excluded from the study due to missing outcomes data. Because this study utilized a pre-existing, de-identified database review, Institutional Review Board approval was not required.

To identify the most severely disabled patients, we included only patients with an admission FIM of 18, which indicates complete dependence in all functional domains. Several studies of patients with DoC have reported that the mean or median FIM on IRF admission was 18 in this population,[7,12,13,14] and based on prior research reporting both FIM and TBI severity, it is likely that the majority, if not all, of these individuals would be classified as having sTBI.[6,12] For the purposes of this study, patients with an IRF admission FIM of 18 following a TBI are designated as sdTBI, as they represent the most *s*everely *d*isabled patients with TBI receiving inpatient rehabilitation.

Definition of Terms

All variables are categorized according to the IRF Patient Assessment Instrument, the instrument used by IRFs at the time to report patient assessment data in accordance with Centers for Medicare and Medicaid Services requirements.[14]

Demographic data included age, sex, race, marital status, proportion living alone prior to admission, proportion living at home prior to admission, defined as the proportion of patients in a given year who were living in a private home or apartment, board and care, assisted living, group home, or transitional living setting prior to their injury, and primary payer source, referring to the party responsible for financing the patient's stay at the IRF. Options for primary payer source include Medicare (Medicare non-Managed Care

Organization (MCO) and Medicare MCO), Medicaid (Medicaid non-MCO and Medicaid MCO), Commercial (Blue Cross, Commercial Insurance, and MCO HMO), Unreimbursed (Private Pay, Unreimbursed, and None), Workers' Compensation and Other (Crippled Children's Services, State Vocational Rehabilitation, Employee Courtesy, Civilian Health and Medical Program of the Uniform Services, Other, and No-Fault Auto Insurance).

Admission data includes onset days, defined as the number of days between the occurrence of the patient's injury and admission to the IRF, and admission FIM, the patient's total FIM score on IRF admission.

Discharge data includes LOS, referring to the number of days spent in the IRF, excluding program interruptions resulting in readmission to an acute care hospital, discharge FIM, the patient's total FIM score on IRF discharge, FIM gain, the calculated difference between total FIM score at admission and the total FIM score at discharge, LOS efficiency, the average FIM gain per day of rehabilitation, 30-day rate of transfer to acute facility, indicating the proportion of patients who were readmitted to an acute care hospital from IRF during the first 30 days of their rehabilitation stay, and percent discharged to the community, referring to the proportion of total patients in a given year who were discharged to a community-based setting, which includes any of the above *living at home* categories.

Functional Independence Measure (FIM) is an instrument which provides information about an individual's level of disability, indicating how much assistance is needed for the individual to carry out activities of daily living, mobility, and cognitive tasks. It includes 18 items across 6 domains (self-care, sphincter control, mobility, locomotion, communication, and social cognition) which are grouped into 2 subscales: motor and cognition. These domains are rated from 1 (complete dependence) to 7 (complete independence). Total FIM scores range from 18 to 126, with a higher score indicating a higher level of independence. A score of 18 indicates total assistance is required for all motor and cognitive functions.[15]

Statistical Analysis

Stata version 16 was used for the analysis. For the years 2002 to 2017, annual demographic, admission and discharge data were obtained for patients meeting the study criteria. Mean and standard deviation were examined for all variables, aside from those reported as a proportion. The number of patients with sdTBI as a proportion of total discharges for patients with TBI was calculated for each year. To assess for trends over time, simple linear, piecewise linear, quadratic, or cubic regressions were constructed for each metric based on whichever provided the most accurate fit based on the coefficient of determination. Fractional logistic regressions were utilized for metrics reported as a proportion. Additional analyses were done to examine the LOS trend by payer by obtaining annual and total mean and standard deviation LOS for each payer.

Results

Study Sample

The UDSMR contained data for 253,353 patients admitted for TBI who were discharged between 2002 and 2017, 10,187 of whom had an admission FIM of 18 (sdTBI). Of these,

14 patients were discharged against medical advice and 75 died while in IRF, leaving 10,098 (99.1%) in the final group for analysis. In the final sample, 73.8% were male and 96.0% were living at home prior to injury.

Over the 16-year period, the number of patients with sdTBI discharged from IRF decreased from 649 to 488 per year (Table 1), and the number of patients with sdTBI as a proportion of total patients with TBI decreased by more than 50%, from 5.5% to 2.5% (Figure 1), both according to statistically significant regressions ($p = 0.001$, $p < 0.001$) (Supplemental Table 1, Supplemental Table 2).

Patient Characteristics

From 2002 to 2017, the mean age increased from 43.0 (standard deviation, 21.0) to 53.7 (21.3) years (Table 2), with a corresponding statistically significant regression ($p < 0.001$). There were statistically significant decreasing trends in the proportion of female patients, White patients, and patients categorized as Other race ($p < 0.001$, $p < 0.001$, $p < 0.001$). There were statistically significant increasing trends in the proportion of Black and Hispanic patients ($p < 0.001$, $p = 0.034$). The regression for the proportion of Multi Race patients was not statistically significant ($p = 0.104$). There was a statistically significant increasing trend in the proportion of married patients and the proportion of patients living at home prior to injury ($p = 0.003$, $p < 0.001$). There was a small but statistically significant decreasing trend in the proportion of patients living alone ($p = 0.029$). In terms of primary payer source, there was a twofold increase in the proportion of Medicare patients from 21.3% to 43.2%, and a concurrent decrease in the proportion of commercially-insured patients from 42.7 to 24.8%, with corresponding statistically significant increasing and decreasing trends respectively ($p < 0.001$, $p < 0.001$). In comparison, less change was observed in the proportion of patients with Medicaid, Worker's Compensation, and Other primary payer source, and in the proportion of Unreimbursed patients. There was a small but statistically significant negative trend in the proportion of patients with Worker's Compensation and Unreimbursed patients ($p = 0.004$, $p = 0.010$), and a small, statistically significant positive trend in the proportion of patients with Other payer source ($p = 0.001$). The regression for the proportion of Medicaid patients was not significant ($p = 0.127$).

Admission and Discharge Data

The trend in mean onset days was not significant ($p = 0.324$). Mean LOS decreased by 12.2 days, from 41.5 (36.2) to 29.3 (24.9) days, which was a statistically significant trend ($p <0.001$) (Figure 2). Average LOS for Medicare patients across all years was 20.8 days while average LOS for commercial insurance patients was 41.9 days. LOS for commercial insurance patients underwent a steeper decline than LOS for Medicare patients. The mean discharge FIM, which decreased from 47.2 (31.0) to 43.4 (26.8) underwent a small, statistically significant negative trend ($p = 0.022$), as did FIM gain ($p = 0.022$). The regression for LOS efficiency was not significant ($p = 0.062$). There was a very small, statistically significant negative trend in 30-day rate of transfer to acute facility ($p < 0.001$) and a very small, statistically significant positive trend in the proportion of patients discharged to the community ($p < 0.001$).

Discussion

This study examined national trends in IRF admissions for the most severely disabled TBI patients over a 16-year period. The proportion of patients with an admission FIM of 18 dropped by about 50% over the study period, with a decline in the absolute number of patients with an admission FIM of 18. The mean age on admission to IRF increased by approximately 10 years and there was a nearly two week decrease in mean LOS, which was more than double the decrease observed among all IRF patients with TBI.[1] These findings suggest that the most severely disabled and vulnerable population of patients with TBI are receiving less rehabilitative services now, as compared to 16 years ago. Prior work has demonstrated significant improvement, including recovery of functional independence, in approximately 20% of patients with sdTBI, including those with DoC, up to 10 years post-injury.[8] Current practice guidelines recommend that these patients receive comprehensive rehabilitation services from a multidisciplinary team who can provide ongoing functional monitoring and updated care plans.[3,16] Failure to adhere to these guidelines may lead to worse outcomes in patients with sdTBI given their medical complexity. The findings of this study may indicate a shift away from specialized rehabilitative care in patients with severe disability following TBI, which would contradict current guidelines.[3,16]

Of the 253,353 patients with TBI discharged from rehabilitation facilities from 2002–2017, only 10,187 had an admission FIM of 18. Despite an increasing number of TBI admissions to IRFs, the number of patients with severe disability admitted to IRFs decreased over the study period. The decrease in the proportion of patients with sdTBI may represent a combination of factors. Primary prevention, including seatbelt legislation and helmet safety programs, may play a role. There was a decrease in the number of motor vehicle crashes and TBI-related hospitalizations due to motor vehicle crashes over the study period,[17,18] possibly related to increased seatbelt compliance and vehicle safety.[19,20] Frontal air bags, which have been shown in trials to reduce the incidence of brain injury in frontal crashes, became a requirement for all passenger vehicles in the US in 1999.[20] Ridesharing applications such as Uber® and Lyft® became prevalent in most major cities in the US between 2011 and 2014, and studies have suggested that they may reduce alcohol-related motor vehicle accidents.[22,23] This premise is supported by data from the National Highway Traffic Safety Administration's roadside survey, which shows a decreasing trend in alcohol use among drivers from 1996 to 2014.[24] Continued improvements in helmets and helmet use during sporting events, [25–27] improvements in pre-hospital care, and increased availability of specialized neurointensive care[28,29] may also have contributed to the decreasing incidence of sdTBI. The aging of the US population is another relevant factor, as older individuals are more likely to be injured in falls rather than motor vehicle accidents, and this shift to a lower energy mechanism could result in less severe injuries despite an increase in the number of injuries overall. In 2009, falls surpassed motor vehicle accidents as the largest cause of traumatic injuries in the National Trauma Data Bank, and they are now the leading cause of TBI-related Emergency Department visits, hospitalizations and deaths in the US.[18,30]

Following a severe TBI there are several factors that may play a role in whether a patient is discharged to an IRF. Early intensive care unit (ICU) mortality is particularly relevant for patients with sTBI, with withdrawal of life-sustaining treatment (WLST) representing

the most common cause of in-hospital mortality.[31] Studies published in 2011 and 2016 have estimated in-hospital mortality for patients with sTBI among Canadian and North American centers to be 31.7% and 34%, respectively.[31,32] Early WLST has come under close scrutiny in view of the absence of precise early prognostic indicators and the growing body of evidence showing that even patients with DoC who are admitted to an IRF may regain independence over time.[5,6,7,8] There has also been a shift toward alternative acute care discharge dispositions and changes in reimbursement practices that may not align with the patients' clinical prognosis. Facility concerns about LOS under the current reimbursement structures may result in IRF admissions practices that select against the most severely disabled patients. One study utilizing three large national datasets concluded that 57–65% of individuals with moderate to severe TBI are discharged directly home from acute hospitals rather than to post-acute rehabilitation facilities.[33] In these cases, outcome remains unknown. Further investigation is required to identify how the rates of WLST and alternate discharge dispositions are changing over time.

Our results indicate that IRF LOS for patients with sdTBI is decreasing dramatically, and at a faster rate than the decrease occurring in the TBI population at-large. The 12.2 day decrease in mean LOS for patients with sdTBI in this study was more than twice the decrease observed in the entire TBI population during the same time frame.[1] The mean LOS for the TBI population at-large decreased by approximately 23.7% while the mean LOS for patients with sdTBI decreased by 29.4%.[1] This shift is likely due, in part, to changes in reimbursement structures for IRFs under the Affordable Care Act (ACA), including the case mix group average LOS, which reward efficiency in care delivery while potentially resulting in incentives that impede service delivery to those with the greatest need.[34] Severely disabled patients take longer to demonstrate functional gains, and current reimbursement practices may not account for this or even discourage IRF admissions for this population. Given the average LOS for Medicare patients was about 50% that of commercial insurance patients, the shift to Medicare as the primary payer for this population in 2013 is likely a major driver of this trend. Additional investigation is needed to better understand the declines in LOS for commercial insurance, which still accounts for a large portion of these patients. Importantly, the impact of duration of IRF stay on patient outcomes is not known, and research in this area has been limited.[12]

The downward trend in discharge FIM may result in an increased need for home healthcare services, an increased caregiver burden at the time of IRF discharge, and delayed return to functional independence and employment. The impact of these changes in LOS and discharge FIM on discharge disposition during the study is unclear. The proportion of patients discharged to the community appeared to have a downward trend through 2010 but underwent large fluctuations in the later years which were not well captured by the regression analysis. The proportion discharged to the community throughout the study, ranging from 36.9–46.4%, was notably lower than the 53.4% of patients with sdTBI discharged to the community from 1989–1991.[11] It was also lower than that for the general TBI population, which had a 70.5–75.2% annual rate of discharge to the community over the study period.[1]

The increase in mean age on admission to IRF was similar to that for the entire TBI population over the study period.[1] This corresponds with a shift in the primary mechanism of injury from motor vehicle accidents to falls. The shift away from commercial insurance and toward Medicare as the primary payer source also reflects the shift observed in the TBI rehabilitation population as a whole, in which the proportion of Medicare patients also increased by approximately 20%.[1] The implications include a rehabilitation patient population with more comorbidities who are at greater risk for additional complications.

Strengths of this study include its utilization of a large dataset with representation from over 70% of IRFs in the US, and the use of a standardized outcome metric, the FIM, which was broadly used in rehabilitation settings across the US during this time. The use of an IRF dataset is also a limitation, as the ability to answer many of the questions in this study would require longitudinal data across healthcare settings. Another limitation is the lack of injury-specific data in the UDSMR, such as the specific medical diagnosis, the severity of injury, and the etiology, which could allow for further characterization and classification of the study population. Despite these limitations, this study represents an important contribution to the literature in that it empirically demonstrates a marked decrease in the proportion of patients with sdTBI and DoC admitted to IRFs. It also reveals decreases in the IRF LOS for these individuals, which could increase the rate of medical complications, limit potential for recovery, and impact clinical trial enrollment.

The implications of reduced sdTBI admissions to IRF and decreased LOS require further investigation. Further exploration of trends in discharge disposition from acute care and the factors that impact such decisions is warranted to help elucidate the downward trend in rehabilitation admissions. Finally, additional research is needed to characterize potential reasons that severely disabled patients have a large downward trend in their rehabilitation LOS and to understand the implications of decreased LOS on discharge disposition and long-term outcomes.

Conclusion

Overall, this study adds to prior work examining trends in patients admitted to IRFs after TBI by focusing on the most severely disabled patients. The proportion of patients with sdTBI decreased by over 50% during the 16-year study period, and was accompanied by a decrease in the absolute number of patients with sdTBI. Patients with sdTBI also experienced a nearly two-week decrease in mean LOS, and their mean age at the time of rehabilitation admission increased by over 10 years. These trends may be driven by multiple factors, including primary prevention, early ICU mortality, alternate discharge dispositions from acute care, and changes in rehabilitation reimbursement structures. These findings may have widespread implications for long-term patient outcomes and clinical trials involving patients with sdTBI. Further research is needed to evaluate the factors responsible for these trends and to identify their impact on patient outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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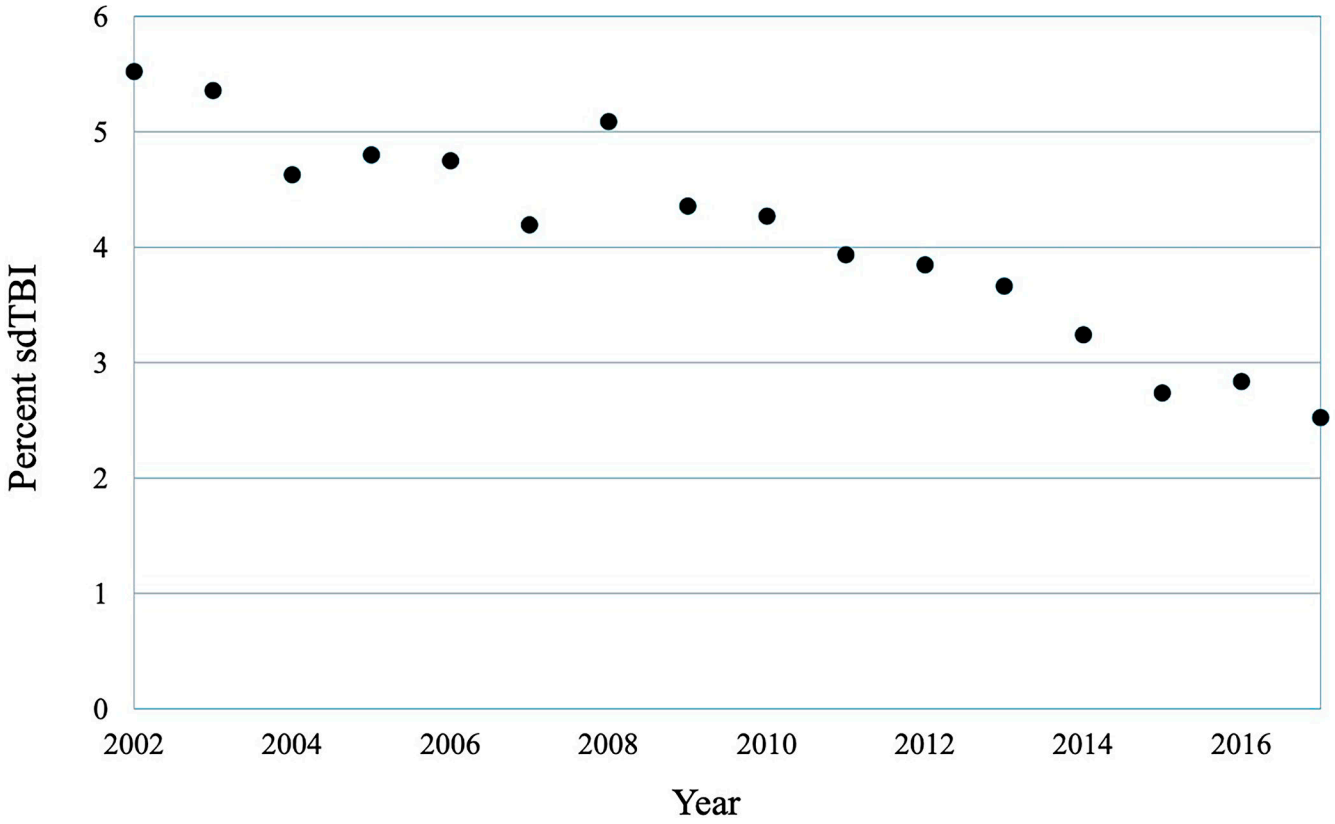

Figure 1.

Percent sdTBI discharges between 2002 and 2017. Patients with sdTBI are those with TBI admitted to IRF with FIM 18. Percent sdTBI = (number of sdTBI discharges / all TBI discharges) * 100. IRF: inpatient rehabilitation facility; TBI: traumatic brain injury; FIM: functional independence measure.

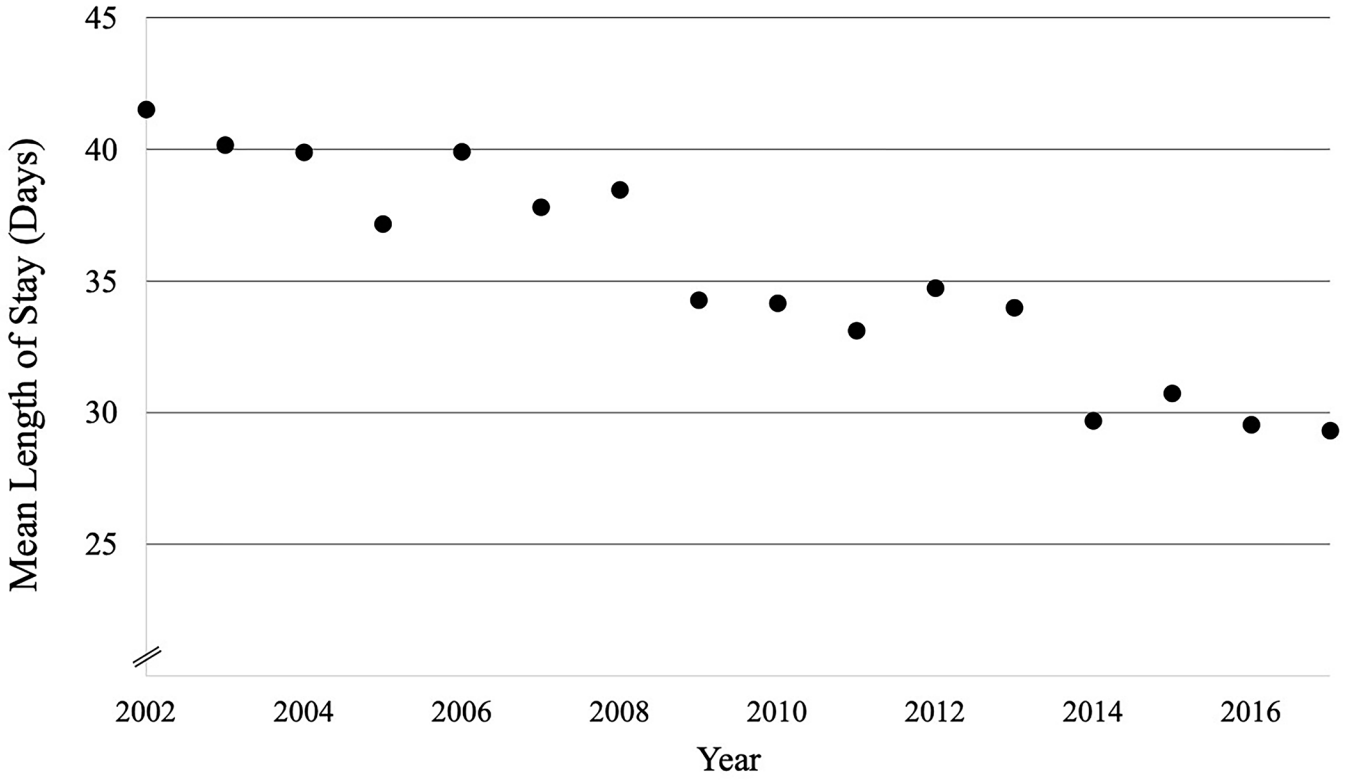

Figure 2.

Mean length of stay for patients with TBI admitted to IRF with FIM 18 between 2002 and 2017. IRF: inpatient rehabilitation facility; TBI: traumatic brain injury; FIM: functional independence measure.

TABLE 1.

MEDICAL AND DISCHARGE DATA FOR PATIENTS WITH TBI ADMITTED TO IRF WITH FIM 18

Year	Total Patients	Mean LOS (Std Dev)	Mean Onset Days (Std Dev)	Mean Discharge FIM (Std Dev)	Mean Discharge Motor FIM (Std Dev)	Mean Discharge Cognitive FIM (Std Dev)	Mean FIM Gain (Std Dev)	Mean Motor FIM Gain (Std Dev)	Mean Cognitive FIM Gain (Std Dev)	Mean LOS Efficiency (Std Dev)	30-Day Rate of Transfer to Acute Facility	% Discharged to Community (Std Dev)
2002	649	41.5 (36.2)	39.5 (45.6)	47.2 (31.0)	35.1 (24.3)	12.1 (7.7)	29.2 (31.0)	22.1 (24.3)	7.14 (7.67)	0.77 (1.0)	23.9	46.4
2003	628	40.2 (32.9)	46.7 (55.6)	46.0 (29.6)	34.2 (23.4)	11.8 (7.3)	28.0 (29.6)	21.2 (23.4)	6.79 (7.27)	0.79 (1.1)	25.6	45.7
2004	575	39.9 (39.4)	44.1 (50.3)	44.7 (29.6)	33.4 (23.6)	11.3 (7.1)	26.7 (29.6)	20.4 (23.6)	6.29 (7.13)	0.77 (1.0)	28.7	44.7
2005	689	37.2 (32.9)	42.8 (51.7)	44.9 (29.2)	33.2 (22.8)	11.7 (7.4)	26.9 (29.2)	20.2 (22.8)	6.71 (7.42)	0.83 (1.2)	28.6	43.1
2006	714	39.9 (42.0)	42.4 (52.0)	45.1 (29.9)	33.2 (23.5)	11.9 (7.6)	27.1 (29.9)	20.2 (23.5)	6.92 (7.60)	0.85 (1.1)	29.8	40.9
2007	646	37.8 (34.3)	44.3 (51.0)	40.9 (27.0)	29.9 (21.2)	11.0 (7.1)	22.9 (27.0)	16.9 (21.2)	6.02 (7.14)	0.71 (1.0)	29.3	38.2
2008	837	38.5 (36.5)	48.1 (55.4)	43.0 (28.6)	31.3 (22.4)	11.7 (7.3)	25.0 (28.6)	18.3 (22.4)	6.70 (7.31)	1.12 (1.6)	31.2	39.4
2009	735	34.3 (34.4)	40.8 (48.8)	44.1 (28.6)	32.0 (22.3)	12.0 (7.6)	26.1 (28.6)	19.0 (22.3)	7.04 (7.62)	1.37 (2.0)	30.6	39.2
2010	683	34.2 (31.4)	43.2 (53.4)	42.7 (26.6)	31.3 (21.2)	11.4 (6.8)	24.7 (26.6)	18.3 (21.2)	6.44 (6.76)	1.19 (1.5)	30.5	37.5
2011	639	33.1 (26.8)	41.9 (47.0)	45.1 (28.5)	32.8 (22.6)	12.3 (7.4)	27.1 (28.5)	19.8 (22.5)	7.29 (7.37)	0.92 (1.1)	32.1	39.4
2012	647	34.7 (30.4)	40.7 (45.9)	44.8 (27.2)	32.5 (21.5)	12.3 (7.0)	26.8 (27.2)	19.5 (21.5)	7.32 (6.96)	0.99 (1.2)	33.4	38.9
2013	621	34.0 (27.5)	40.6 (49.3)	44.5 (27.3)	32.4 (21.4)	12.1 (7.1)	26.5 (27.3)	19.4 (21.4)	7.07 (7.14)	0.94 (1.2)	28.2	44.7
2014	540	29.7 (25.5)	41.3 (52.4)	43.9 (27.5)	32.1 (21.7)	11.8 (7.0)	25.9 (27.5)	19.1 (21.7)	6.83 (6.98)	1.01 (1.2)	31.2	38.1
2015	497	30.7 (24.4)	40.9 (50.5)	44.3 (27.4)	32.2 (21.5)	12.1 (7.2)	26.3 (27.4)	19.2 (21.5)	7.13 (7.19)	1.03 (1.3)	28.5	44.9
2016	510	29.5 (28.0)	37.5 (42.9)	42.4 (27.4)	30.8 (21.7)	11.6 (6.9)	24.4 (27.4)	17.8 (21.7)	6.62 (6.87)	0.97 (1.2)	31.5	36.9
2017	488	29.3 (24.9)	42.0 (52.4)	43.4 (26.8)	31.4 (21.1)	12.0 (7.3)	25.4 (26.8)	18.4 (21.1)	6.99 (7.27)	1.02 (1.2)	30.5	41.4

TBI: traumatic brain injury; IRF: inpatient rehabilitation facility; FIM: Functional Independence Measure; LOS: length of stay; Std Dev: standard deviation

TABLE 2.

DEMOGRAPHICS FOR PATIENTS WITH TBI ADMITTED TO IRF WITH FIM 18

						Race					Primary Payer Source			
Year	Mean Age (Std Dev)	% Female	% Married	% Living Alone	% Living at Home Premorbidly	% White	% Black	% Hispanic	% Other	% Multi Race	% Medicare	% Medicaid	% Commercial	% Unremimbur
2002	43.0 (21.0)	28.4	44.0	17.3	94.6	77.6	11.2	8.5	2.2	0.5	21.3	15.3	42.7	6.5
2003	42.1 (21.0)	26.5	38.5	14.5	93.5	75.7	11.1	9.4	3.4	0.5	19.6	16.2	35.2	8.9
2004	44.2 (21.9)	29.0	41.4	15.7	95.8	77.1	8.8	10.4	3.5	0.2	23	12.5	36.5	7.1
2005	45.1 (22.4)	28.6	38.1	16.5	96.1	80.9	9.0	6.4	3.4	0.3	26.4	13.9	35	7.1
2006	47.8 (22.2)	27.3	41.0	14.7	95.6	80.5	9.5	4.9	4.9	0.3	28.4	15.4	33.5	6.2
2007	47.4 (22.8)	25.7	41.9	17.5	95.1	79.7	9.6	6.1	4.6	0.0	26.1	15.8	32.7	5.7
2008	47.3 (21.7)	25.2	38.3	19.4	95.1	80.8	7.1	7.0	4.9	0.2	24.4	17.6	35.2	4.7
2009	50.5 (22.6)	27.2	42.0	18.9	97.0	80.0	7.8	7.8	4.2	0.3	33.6	16.9	31.7	4.5
2010	48.5 (23.1)	23.0	40.3	18.9	95.6	79.2	9.3	6.9	4.2	0.5	31.6	17.3	30.9	5.9
2011	49.3 (22.6)	26.4	38.5	18.3	95.3	78.4	8.9	8.6	3.8	0.3	34.3	15.7	29.1	4.7
2012	48.6 (21.1)	25.0	40.9	18.9	97.0	77.6	10.6	6.6	4.9	0.3	28.8	17.9	30	6.8
2013	49.4 (23.3)	25.0	41.2	15.8	98.7	80.0	9.4	7.0	3.3	0.3	35.4	13	31.2	6.9
2014	51.8 (22.7)	26.7	44.0	17.3	96.4	75.4	10.6	9.4	4.2	0.4	39	14.7	28.6	5.3
2015	52.1 (22.4)	25.6	44.2	13.5	97.1	73.1	12.6	9.0	4.8	0.4	37.7	15.9	27.8	4.7
2016	53.4 (22.9)	26.3	42.3	14.2	96.1	74.6	9.1	11.4	4.6	0.4	41.7	17.7	24.3	5
2017	53.7 (21.3)	23.6	47.5	17.0	97.1	71.2	14.4	7.2	4.9	2.3	43.2	16.9	24.8	3.2

TBI: traumatic brain injury; IRF: inpatient rehabilitation facility; FIM: Functional Independence Measure; Std Dev: standard deviation