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Original Article

Factors Associated With Rehabilitation Length of Stay in Patients With Traumatic Brain Injury: A Retrospective Cohort Study

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HIGHLIGHTS

- Patients with traumatic brain injury have variable rehabilitation courses.
- Lower Section GG scores are predictive of a long rehabilitation length of stay (LOS).
- Section GG scores should be used to help customize rehabilitation LOS.

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Factors Associated With Rehabilitation Length of Stay in Patients With Traumatic Brain Injury: A Retrospective Cohort Study

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ABSTRACT

This retrospective cohort study aimed to identify predictive factors for patients with traumatic brain injury (TBI) requiring short (≤ 14 days) or long (≥ 15 days) rehabilitation length of stays (LOSs).The study was conducted in an acute rehabilitation hospital associated with a community-based tertiary medical center. Patients who were admitted to the acute inpatient rehabilitation unit with TBI between January 2020 and September 2022 were included (n = 197). The mean rehabilitation LOS of the 197 patients was 16.73 ± 9.4 days. A long rehabilitation LOS was associated with a higher rate of urinary tract infection in the rehabilitation facility ($p = 0.002$), a higher rate of lung infection in the inpatient rehabilitation facility ($p = 0.003$), unplanned readmission to acute care ($p < 0.001$), a longer LOS in acute care before admission to rehabilitation ($p < 0.001$), and a lower Section GG score on admission to rehabilitation ($p < 0.001$). The logistic regression model revealed having lower Section GG scores on admission to rehabilitation as the only factor predictive of a long rehabilitation LOS (odds ratio, 0.91; $p < 0.001$). Our study revealed that the Section GG score at admission to inpatient rehabilitation facilities is a predictor of rehabilitation LOS.

Keywords: Traumatic Brain Injuries; Rehabilitation; Length of Stay

INTRODUCTION

Traumatic brain injury (TBI) is a major cause of mortality and morbidity in the United States of America (USA) [1]. In 2018, 223,050 nonfatal TBI-related hospitalizations occurred in the USA and 60,565 Americans succumbed to the injury [2]. It was estimated that 1.1% of the American population experience long-term disability following TBI [3]. The consequences of TBI include gait disturbances, emotional difficulties, cognitive impairment, behavioral changes, and functional decline [3]. Rehabilitation is believed to aid the recovery process and is considered an important part of post-acute care for patients with TBI [4]. Rehabilitation is recommended by a few published clinical practice guidelines for TBI, with strong evidence suggesting that more intensive rehabilitation programs can lead to earlier functional gain in patients who sustained moderate or severe TBI [4-7]. Even though the goal of rehabilitation is to optimize patients' functional status and studies have suggested that longer rehabilitation length of stay (LOS) is associated with functional gain and cognitive recovery [8-10], patients

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may receive different lengths of inpatient rehabilitation service before discharge due to medical conditions, comorbidities, payer sources, or health care policies [11,12]. Therefore, by understanding which factors are related to a short or long rehabilitation LOS, physiatrists can customize inpatient rehabilitation plans for patients, maximize their functional gain during their inpatient rehabilitation, and potentially prevent unnecessary prolonged stays in rehabilitation facilities.

Many factors have been associated with LOS in rehabilitation units for patients with TBI [13-18]. However, previous studies on this topic have either not addressed or only partially addressed some factors that might affect rehabilitation LOS which include different types of bone fractures, medical conditions that increase the risk of falls such as Parkinson's disease, and other functional assessment tools besides functional independence measure (FIM) [13-18]. In addition, although the clinical characteristics of patients with TBI including age, primary payer source, and the ratio of the mechanisms leading to brain injuries have evolved over the past two decades, research on this topic during this period has been sparse [19-22]. Thus, this study aimed to identify additional factors that may be correlated with a short or long rehabilitation LOS in patients with TBI nowadays.

MATERIALS AND METHODS

Study population

This retrospective study was conducted at a single acute rehabilitation hospital associated with a local community-based tertiary medical center. The appropriate Institutional Review Board (IRB) declared this study exempt from IRB requirements under category 45 CFR 46.104(d). Patients admitted to the inpatient rehabilitation facility (IRF) with a diagnosis of TBI between January 2020 and September 2022 were screened for eligibility using electronic medical records stored in the Uniform Data System for Medical Rehabilitation. Patients with TBI must be able to participate in 3 hours of therapy daily or 15 hours of therapy weekly to be qualified for admission to the IRF. The rehabilitation impairment categories (RIC) used for screening for eligibility were TBI (RIC group 2), and multiple major traumas with TBI or spinal cord injury (RIC group 18). The exclusion criteria were as follows: Initial Glasgow Coma Scale (GCS) unavailable in the medical records, TBI not considered the reason for admission to the IRF, patients who were not admitted from an acute care hospital, and patients who were readmitted to acute care during inpatient rehabilitation stay but did not return to the facility to complete the rehabilitation course.

Independent variables

The independent variables included: sex; age; ethnicity; type of insurance; living status; severity of brain injury; mechanism of brain injury; presence of skull, facial, pelvic, extremity, or rib fractures; need for brain surgery after brain injury; history of diabetes mellitus; history of Parkinson's disease; urinary tract infection (UTI) during the rehabilitation stay; lung infection during the rehabilitation stay; readmission to acute care during the rehabilitation stay; functional score on admission to the IRF and LOS in acute care hospitals. All information concerning the independent variables was retrospectively obtained using the electronic medical record system. Types of insurance were categorized as Medicare, Medicaid, commercial, and others. Living status was classified as living alone, living with someone, homeless, and incarcerated according to the patients' living situation prior to brain injury. Severity of brain injury was categorized as mild (GCS 13–15), moderate (GCS

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9–12), and severe (GCS 3–8) on the basis of the initial GCS scores. Mechanisms of brain injury were grouped into falls, motor vehicle crashes, and others. Presence of skull, facial, pelvic, extremity, or rib fractures was determined from the relevant radiology reports. We defined brain surgery as burr hole surgery, craniectomy, or craniotomy for brain injury before completion of the inpatient rehabilitation course. Ventriculoperitoneal shunt placement and middle meningeal arterial embolization were not considered brain surgery. All UTI were confirmed with urine culture. Diagnosis of lung infection was based on clinical symptoms, laboratory tests, and imaging results. Types of lung infections included pneumonia, lung abscesses, bronchitis, and coronavirus disease 2019 (COVID-19). The Section GG score, a standardized functional assessment that consists of 7 self-care and 17 mobility items, was used as the functional score at admission to the IRF.

Outcome variables

The outcome variable was the LOS in our IRF. The average rehabilitation LOS for patients with TBI in the USA is approximately 14 days in recent years [22,23]. Therefore, we defined a short rehabilitation LOS as ≤ 14 days and a long rehabilitation LOS as ≥ 15 days. For patients who completed their inpatient rehabilitation course at the IRF following short-term readmission to an acute care hospital during their rehabilitation stay, the days spent in the acute care hospital were excluded from the rehabilitation LOS and added to the LOS at acute care hospitals. No specific or universal discharge criteria were used in the IRF for patients with TBI as discharge planning has to be individualized. Patients were discharged to the community only when the responsible rehabilitation team thought a safe discharge could be achieved.

Statistical analyses

All analyses were performed by using SPSS version 29.0 (SPSS Inc., Chicago, IL, USA). To detect between-group differences, χ^2 tests were used for categorical variables, two-sample t-tests and analysis of variance tests were used for continuous variables. Statistical significance was set at $p < 0.05$. Variables with $p < 0.05$ were included in a multivariate logistic regression model to evaluate their association with readmission to acute care hospitals. Nagelkerke's R^2 was used to evaluate the performance of the logistic regression model and the Hosmer–Lemeshow test was used to assess the goodness of fit of the logistic regression model.

RESULTS

A total of 237 patients were eligible for the study according to the RIC; among them, 40 were excluded after applying the exclusion criteria, leaving 197 patients (128 men, 69 women) for analyses.

Table 1 shows the demographic, clinical characteristics, complications during rehabilitation, acute LOS, rehabilitation LOS and functional scores of the patients. The study population had a mean age of 66.11 ± 19.24 years, mean acute LOS of 11.2 ± 9.8 days, mean rehabilitation LOS of 16.73 ± 9.4 days, and mean Section GG score of 48.27 ± 17.64 upon admission. The overall mean initial GCS score was 13.08 ± 3.31, with 157 (80%) cases of mild TBI, 15 (7%) cases of moderate TBI, and 25 (13%) cases of severe TBI. Regarding the mechanism of brain injury, 129 (65%) were falls, 63 (32%) were motor vehicle accidents, 2 (1%) were others and 3 (2%) were unknown.

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Table 1. Demographic, clinical characteristics, complications during rehabilitation, LOS, and functional scores of the study population

Variables	Values
No. of patients	197 (100.0)
Age (yr)	66.11 ± 19.24
Sex	
Male	128 (65.0)
Female	69 (35.0)
Ethnicity	
White	161 (81.7)
African American	9 (4.5)
Hispanic	15 (7.6)
Others	2 (1.0)
Unknown	10 (5.1)
Type of insurance	
Medicare	107 (54.3)
Medicaid	11 (5.6)
Commercial	36 (18.3)
Others	43 (21.8)
Living status	
Living alone	67 (34.0)
With someone	126 (64.0)
Homeless	3 (1.5)
Incarcerated	1 (0.5)
Initial GCS score	13.08 ± 3.31
Severity of brain injury	
Mild	157 (79.7)
Moderate	15 (7.6)
Severe	25 (12.7)
Mechanism of brain injury	
Falls	129 (65.5)
Motor vehicle crashes	63 (32.0)
Others	2 (1.0)
Unknown	3 (1.5)
Skull fracture	
Yes	37 (18.8)
No	160 (81.2)
Facial fracture	
Yes	47 (23.9)
No	150 (76.1)
Extremity fracture	
Yes	35 (17.8)
No	162 (82.2)
Pelvic fracture	
Yes	17 (8.6)
No	180 (91.4)
Rib fracture	
One side	40 (20.3)
Bilateral	13 (6.6)
No	144 (73.1)
Need for brain surgery after brain injury	
Yes	23 (11.7)
No	174 (88.3)
Diabetes mellitus	
Yes	47 (23.9)
No	150 (76.1)
Parkinson's disease	
Yes	8 (4.1)
No	189 (95.9)
UTI	
Yes	23 (11.7)
No	174 (88.3)

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Table 1. (Continued) Demographic, clinical characteristics, complications during rehabilitation, LOS, and functional scores of the study population

Variables	Values
Lung infection	
Yes	8 (4.1)
No	189 (95.9)
Unplanned readmission to acute care	
Yes	17 (8.6)
No	180 (91.4)
Section GG score	48.27 ± 17.64
Acute LOS (day)	11.20 ± 9.80
Rehabilitation LOS (day)	16.73 ± 9.40

Values are presented as mean ± standard deviation or number (%).
LOS, length of stay; GCS, Glasgow Coma Scale; UTI, urinary tract infection.

Univariate analyses were conducted for the short and long rehabilitation LOS groups (**Table 2**). In total, 103 Patients had a short rehabilitation LOS, with a mean LOS of 10.1 ± 3.1 days, whereas 94 patients had a long rehabilitation LOS, with a mean LOS of 23.99 ± 8.59 days. No significant differences were found between the short and long LOS groups in terms of age ($p = 0.412$); sex ($p = 0.241$); ethnicity ($p = 0.74$); type of insurance ($p = 0.452$); living status ($p = 0.901$); severity of brain injury ($p = 0.375$); mechanism of brain injury ($p = 0.567$); presence of skull ($p = 0.182$), facial ($p = 0.251$), extremity ($p = 0.391$), pelvic ($p = 0.142$), or rib ($p = 0.502$) fractures; need for brain surgery after brain injury ($p = 0.368$); history of diabetes mellitus ($p = 0.598$) and history of Parkinson's disease ($p = 0.393$). The t-tests for ethnicity and mechanism of brain injury excluded patients who were classified as unknown and others, respectively. Homeless and incarcerated patients were not included in the t-test for living status owing to their small number.

Table 2. Univariate analysis of the short rehabilitation LOS group and the long rehabilitation LOS group

Variables	Short rehabilitation LOS (rehabilitation LOS ≤ 14 days)	Long rehabilitation LOS (rehabilitation LOS ≥ 15 days)	p value
No. of patients	103	94	N/A
Rehabilitation LOS (day)	10.10 ± 3.10	23.99 ± 8.59	N/A
Age (yr)	65.03 ± 19.74	67.29 ± 18.71	0.412
Sex			0.241
Male	63 (61.2)	65 (69.1)	
Female	40 (38.8)	29 (30.9)	
Ethnicity*			0.740
White	83 (80.6)	78 (83.0)	
African American	4 (3.9)	5 (5.3)	
Hispanic	9 (8.7)	6 (6.4)	
Others	0 (0.0)	2 (2.1)	
Unknown	7 (6.8)	3 (3.2)	
Type of insurance			0.452
Medicare	51 (49.5)	56 (59.6)	
Medicaid	7 (6.8)	4 (4.3)	
Commercial	22 (21.4)	14 (14.9)	
Others	23 (22.3)	20 (21.3)	
Living status†			0.901
Living alone	35 (34.0)	32 (34.0)	
With someone	67 (65.0)	59 (62.8)	
Homeless	1 (1.0)	2 (2.1)	
Incarcerated	0 (0.0)	1 (1.1)	
Severity of brain injury			0.375
Mild	84 (81.6)	73 (77.7)	
Moderate	9 (8.7)	6 (6.4)	
Severe	10 (9.7)	15 (16.0)	

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Table 2. (Continued) Univariate analysis of the short rehabilitation LOS group and the long rehabilitation LOS group

Variables	Short rehabilitation LOS (rehabilitation LOS ≤ 14 days)	Long rehabilitation LOS (rehabilitation LOS ≥ 15 days)	p value
Mechanism of injury‡			0.567
Falls	66 (64.1)	63 (67.0)	
Motor vehicle crashes	35 (34.0)	28 (30.0)	
Others	1 (1.0)	1 (1.1)	
Unknown	1 (1.0)	2 (2.1)	
Skull fracture			0.182
Yes	23 (22.3)	14 (14.9)	
No	80 (77.7)	80 (85.1)	
Facial fracture			0.251
Yes	28 (27.2)	19 (20.2)	
No	75 (72.8)	75 (79.8)	
Extremity fracture			0.391
Yes	16 (15.5)	19 (20.2)	
No	87 (84.5)	75 (79.8)	
Pelvic fracture			0.142
Yes	6 (5.8)	11 (11.7)	
No	97 (94.2)	83 (88.3)	
Rib fracture			0.502
One side	18 (17.5)	22 (23.4)	
Bilateral	8 (7.8)	5 (5.3)	
No	77 (74.8)	67 (71.3)	
Need for brain surgery after brain injury			0.368
Yes	10 (9.7)	13 (13.8)	
No	93 (90.3)	81 (86.2)	
Diabetes mellitus			0.598
Yes	23 (22.3)	24 (25.5)	
No	80 (77.7)	70 (74.5)	
Parkinson's disease			0.393
Yes	3 (2.9)	5 (5.3)	
No	100 (97.1)	89 (94.7)	
UTI			0.002
Yes	5 (4.9)	18 (19.1)	
No	98 (95.1)	76 (80.9)	
Lung infection			0.003
Yes	0 (0.0)	8 (8.5)	
No	103 (100.0)	86 (91.5)	
Unplanned readmission to acute care			< 0.001
Yes	1 (1.0)	16 (17.0)	
No	102 (99.0)	78 (83.0)	
Section GG score	58.21 ± 14.14	37.38 ± 14.38	< 0.001
Acute LOS (day)	8.26 ± 5.71	14.43 ± 12.10	< 0.001

Values are presented as mean ± standard deviation or number (%).
LOS, length of stay; N/A, not applicable; UTI, urinary tract infection.
*Patients classified as unknown or others were excluded from the t-test.
†Patients classified as homeless or incarcerated were excluded from the t-test.
‡Patients classified as unknown or others were excluded from the t-test.

Patients with a long rehabilitation LOS were significantly associated with a higher incidence of UTI ($p = 0.002$) during their rehabilitation stay, a higher incidence of lung infection ($p = 0.003$) during their rehabilitation stay, a higher rate of unplanned readmission to acute care hospitals ($p < 0.001$), lower Section GG scores ($p < 0.001$) at admission to the IRF, and longer acute LOS than were patients with a short rehabilitation LOS ($p < 0.001$).

A multivariate logistic regression was subsequently performed to investigate these factors (**Table 3**). The initial model included all significant variables identified on the basis of our

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Table 3. Logistic regression model based on univariate analysis*

Variables	Beta coefficient	OR (95% CI)	p value
UTI	0.82	2.28 (0.69–7.50)	0.175
Unplanned readmission to acute care	2.10	8.16 (0.73–91.46)	0.089
Section GG score	−0.10	0.91 (0.88–0.94)	< 0.001
Acute LOS	0.07	1.06 (1.00–1.12)	0.052

OR, odds ratio; CI, confidence interval; UTI, urinary tract infection; LOS, length of stay.
*Lung infection was removed from the model because there were no cases in the short rehabilitation length of stay group.

results: UTI, lung infection, unplanned readmission to acute care hospitals, Section GG score, and acute LOS. Lung infections were removed from the model because there were no cases in the short LOS group. As shown in **Table 3**, the Section GG score was the only variable that was significantly associated with a long rehabilitation LOS in our model (odds ratio, 0.91; 95% confidence interval, 0.88–0.94; $p < 0.001$). The significantly low odd ratio indicated that patients with lower Section GG scores at admission for rehabilitation were more likely to have a rehabilitation LOS of ≥ 15 days. Nagelkerke's R^2 value was 0.524, indicating that 52.4% of the outcomes could be predicted using the variables in the model. The Hosmer–Lemeshow test showed a p value of 0.825, suggesting a good fit for the logistic regression model.

DISCUSSION

Patients with TBI admitted to medical rehabilitation facilities in the USA are becoming older and having shorter stays at rehabilitation facilities [22]. Lamm et al. [22] proposed that the trend toward an older rehabilitation population after a TBI is attributed to population aging and older individuals being more mobile currently than in previous generations. The overall trend of decreasing rehabilitation LOS in TBI is likely caused by changes in IRF policies and healthcare payment systems [22,24]. Additionally, it has been noticed that the rising mean age of the TBI population may have contributed to a change in the ratio of the mechanisms underlying brain injuries and the primary type of payer source. In recent years, studies have shown that falls account for a higher proportion of the etiology of TBI, and that the use of Medicare has increased in patients with TBI [22,25,26]. Our study population exhibited an older mean age (66.11 years), higher percentage of Medicare users (54.3%), higher prevalence of falls (65.5%) as the mechanism of TBI, and shorter mean rehabilitation LOS (16.73 days) than did the patients with TBI in related studies conducted more than a decade ago [13,15,19]. These findings align with the trend observed by Lamm et al. [22].

FIM is one of the most commonly used functional scales to represent the functional status of patients after TBI [27]. Since October 2019, the Centers for Medicare and Medicaid Services have substituted Section GG for FIM as the measurement tool to evaluate the functional status of patients in IRFs [28]. The Section GG score is an essential part of the IRF Patient Assessment Instrument that all IRF providers must document [28,29]. Currently, no standardized formula is available to convert a Section GG score into an FIM score, but prior research has shown that total Section GG scores have strong correlations with total FIM scores [30]. Our logistic regression model demonstrated that the Section GG score is the most significant factor predicting rehabilitation LOS ≥ 15 days in patients with TBI among the variables analyzed. This result is congruent with the conclusions of prior studies showing that the functional scale is a crucial factor in predicting rehabilitation LOS in patients with TBI [13-17,19].

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LOS in acute care has been commonly selected as a study variable in similar studies and most of them found a strong association between acute LOS and rehabilitation LOS [13-15,17]. Acute LOS was significantly associated with rehabilitation LOS in our study but did not reach statistical significance in the logistic regression model. Although we did not establish the statistical significance of acute LOS as a predictive factor for a long rehabilitation LOS, it remains clinically important and could potentially increase the possibility of a long rehabilitation LOS among patients with TBI.

Readmission to acute care not only interrupts the rehabilitation process but also burdens the health care system [31]. A study showed that interruption during amputee rehabilitation results in a longer LOS in the IRF but does not adversely affect the rehabilitation outcome for those who return to complete their rehabilitation course [32]. Hammond et al. [20] reported that readmission to acute care rehabilitation is a predictor of a longer rehabilitation LOS and failure to be discharged home in patients with TBI. On the basis of our logistic regression model, unplanned readmission to acute care was not a significant predictor of rehabilitation LOS. Of note, the small sample size and potentially unknown variables may have contributed to the discrepancies between our findings and those of Hammond et al. [20]. Further investigation is required to elucidate the predictive capacity of this factor.

Thus far, relatively few studies have included nosocomial infection when determining factors associated with rehabilitation LOS for patients with TBI [33]. A study has identified nosocomial infection as a predictor of rehabilitation LOS in patients admitted to an acute rehabilitation unit [33]. UTI is reportedly the most common nosocomial infection in both acute care and rehabilitation settings [33,34]. In a study conducted by High et al. [15], UTI was categorized as a non-neurologic complication and was associated with rehabilitation LOS. However, non-neurologic complications did not help explain the variance in their regression model [15]. Consistent with their model's findings, our analysis did not reveal that UTI was predictive of rehabilitation LOS. In contrast to the study of High et al. [15], our study only included healthcare-acquired UTIs occurring in the IRF and not those that occurred in acute care. As such, future studies are warranted to determine whether healthcare-acquired UTIs in IRFs are related to rehabilitation LOS.

Our results showed that age was not associated with the rehabilitation LOS ($p = 0.412$). Evidence regarding the predictive value of age for rehabilitation LOS in patients with TBI is conflicting. Cowen et al. [14] reported age as a predictor of rehabilitation LOS, but other studies did not support their finding [13,15,19,35]. Among patients with TBI, older patients typically have more comorbidities than younger patients do, but they tend to sustain fewer severe brain injuries [22,35]. The correlation between age and severity of TBI might partially explain why age is not a reliable predictor of rehabilitation LOS.

According to our analysis, the severity of brain injury was not significantly correlated with rehabilitation LOS. The use of the initial GCS score to stratify the severity of brain injury might explain the lack of a significant relationship between the two variables, and we propose that the severity is potentially a good predictor of rehabilitation LOS. The use of initial GCS scores as a measure of the severity of brain injury has been criticized by experts for its limitations in accurately reflecting the severity [36-38]. Prior studies have found inconsistent results in using initial GCS scores to predict rehabilitation LOS [13-15]. Nevertheless, it continues to be widely utilized in clinical practice owing to its simplicity [36-38]. Some clinicians have recommended including additional information, such as pupil response, to

GCS scores to improve accuracy in predicting clinical outcomes of patients with TBI [39]. The application of more comprehensive assessment tools, such as the Comprehensive Severity Index, may also be considered to determine the severity of brain injury in future research and clinical practice [39].

Prior research has suggested that longer rehabilitation LOS could result in more favorable rehabilitation outcomes [8-10]; however, the actual benefits of a longer rehabilitation LOS have not been firmly established, and it may be associated with adverse effects [40]. In addition, the healthcare payment system in the USA has gradually shifted from a volume-based system to a value-based system [24], which limits inpatient rehabilitation LOS and encourages physicians to provide more efficient care in IRFs. Therefore, reliably estimating the rehabilitation LOS for patients and ensuring efficient use of inpatient rehabilitation are more important than simply offering patients with TBI a longer LOS in IRFs.

Most of study population received care in the IRF during the COVID-19 pandemic. As a result, physicians' clinical practice in the IRF may have been affected by the pandemic. However, the referral standards, admission criteria, readmission policies, and discharge plans for patients admitted to the IRF did not change radically because of COVID-19. Our IRF did not delay or deny admissions of patients with COVID-19 to rehabilitation. In addition, there was no significant change in the characteristics of the patients with TBI admitted to the IRF each year (**Supplementary Table 1**). Furthermore, by using the inclusion and exclusion criteria of this study, the average rehabilitation LOS of patients with TBI admitted to the IRF from 2018 to 2019 (15.57 ± 9.00 days) was not significantly different from the average rehabilitation LOS of our study population ($p = 0.259$). Thus, we believe the impact of the pandemic on our results was minimal.

This study had several limitations. First, because this was a retrospective study, controlling for confounders and ensuring accuracy of the medical records were challenging. Further, the small sample size and relatively low number of moderate-to-severe TBI cases may have prevented the detection of important factors predictive of rehabilitation LOS among patients with TBI. Furthermore, although we found that patients with TBI who were admitted to rehabilitation with lower Section GG scores were more likely to have a rehabilitation LOS of ≥ 15 days, we had insufficient information to directly compare Section GG with other functional scales to determine whether it is superior in predicting rehabilitation LOS. Finally, our study was conducted at a single institution; therefore, there might be potential biases, and the results may not be generalizable.

Our study also had several merits and contributes to existing research as follows. First, our study population of patients with TBI recently admitted to the IRF is representative of the current population with TBI, making our findings more relevant to the present healthcare landscape. Second, our study is the first to assess the relationship between Section GG scores and rehabilitation LOS in patients with TBI. Third, instead of considering rehabilitation LOS as a continuous variable as in most studies, we divided rehabilitation LOS into binary outcomes in our analysis, which makes it easier for physicians to apply the results in clinical practice.

TBI can cause considerable functional decline in patients, thereby impairing their quality of life [3,41]. Inpatient rehabilitation after acute care not only facilitates faster recovery for patients with TBI but also assists patients and their families in becoming physically and

mentally prepared for a new way of living. According to our research, the Section GG score upon admission to IRFs is a predictor of rehabilitation LOS. Inpatient rehabilitation teams can use this factor to predict the rehabilitation LOS of patients with TBI and individualize rehabilitation programs. On the basis of the results of this study, physicians can better predict the LOS of patients with TBI and set up specific inpatient rehabilitation goals such as the anticipated level of functionality upon discharge. This can assist the inpatient rehabilitation team in the process of discharging patients with TBI back to the community including medical equipment preparation, conduction of family training, and determination of appropriate discharge placement.

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SUPPLEMENTARY MATERIAL

Supplementary Table 1

Demographic, clinical characteristics, complications during rehabilitation, LOS, and functional scores of the study population by year

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