Original Research

Successful Community Discharge Among Older Adults With Traumatic Brain Injury Admitted to Inpatient Rehabilitation Facilities

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List of abbreviations: AIS, Abbreviated Injury Scale; AUC, area under the curve; CI, confidence interval; FIM-C, Functional Independence Measure-Cognitive; FIM-M, Functional Independence Measure-Motor; GCS, Glasgow Coma Score; IRF, Inpatient Rehabilitation Facility; IRF-PAI, Inpatient Rehabilitation Facility Patient Assessment Instrument; MBSF, Medicare Master Beneficiary Summary File; NTDB, National Trauma Data Bank; OR, odds ratio; PAC, Post-acute care; SNF, Skilled Nursing Facility; TBI, traumatic brain injury

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Older adults represent most of individuals receiving care in inpatient rehabilitation facilities (IRF) after traumatic brain injury (TBI). IRFs provide ongoing medical care and intensive rehabilitation to facilitate functional improvement and help patients return home. At acute discharge, a patients’ functional status, home environment, and perceived potential for improvement are critical to IRF referral decisions. After IRF admission, clinicians help patients and their families plan for IRF discharge. The anticipated discharge disposition informs plans for home modifications, selection of caregivers, and referrals for future rehabilitative care, among other care decisions. If patients can discharge home, the goal is for them to remain at home without needing to return to a hospital or long-term care facility, a goal reflected in the Centers for Medicare and Medicare Services “Discharge to Community” quality metric.

Intensive and specialized rehabilitation is considered beneficial after brain injury. However, age, functional status, comorbidity burden, and injury severity have the potential to affect patients’ rehabilitative outcomes. Older adults with TBI in IRF differ from their younger counterparts in several of these areas, specifically, they are more likely to have mild brain injuries, multiple chronic conditions, and may have pre-injury declines in health that contributed to sustaining a TBI. However, few studies examining predictors of IRF discharge disposition focused specifically on older adults with TBI. Frequently used data sources have traditionally underrepresented older adults, only include individuals with moderate to severe injuries, or lacked acute injury information (eg, acute severity) that may be relevant in traumatic injuries. Some studies do not account for comorbidities or chronic conditions, or are limited to those reported during the index admission. As a result, there are gaps specific to older adults that may be relevant to IRF discharge planning.

Our objective is to help IRF clinicians by identifying a parsimonious combination of patient, injury, and health status characteristics known at IRF admission that predict a successful discharge home.

**Methods**

**Data sources**

This study used Medicare administrative data linked to the National Trauma Data Bank (NTDB). The NTDB does not contain individually identifiable information to allow a direct link to Medicare data. Therefore, the NTDB and Medicare data were probabilistically linked using a previously described Bayesian
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multi-layer record linkage algorithm. This record-linkage procedure simultaneously links trauma centers and patients within trauma centers. The Bayesian procedure assumes that all pairs of trauma centers from NTDB and Medicare follow a mixture model of links and non-links. In addition, within linked trauma centers, all pairs of individual records from the files follow a mixture model. Under the Bayesian paradigm, the unknown linkage is considered as missing data and sampled with model parameters simultaneously. Details of the linkage algorithm are described in detail in Shan et al (2022). During the linking, we limited the acute hospitals and trauma centers to those with beds designated for burn care to limit the number of potential facilities and increase the accuracy of the linkage.

Medicare data sources included the Medicare Master Beneficiary Summary File (MBSF), Medicare Provider Analysis and Review File, hospice and home health claims, and the Chronic Conditions Warehouse segment of the MBSF. The Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) provided details of functional status (motor and cognitive), prior-living arrangements, and other patient demographic characteristics. Medicare Claims and post-acute assessment data were combined using previously described Residential History File methodology. Residential History File was used to identify pre-injury health care utilization, and successful discharge, by identifying the initial discharge location and subsequent locations for 30 days. The NTDB provided details of the injury and acute management. Brown University Institutional Review Board (IRB) approved the study. The IRB approved a waiver of HIPAA authorization under 45 CFR 164.512. The IRB also granted a waiver of informed consent under 45 CFR 46.116, so informed consent was not obtained.

Sample

In the NTDB and Medicare administrative linked data, we identified Medicare beneficiaries ages 66 years and older, hospitalized after a TBI, then admitted to an IRF between January 1, 2011, and September 30, 2015. The International Classification of Diseases, ninth revision was used to identify TBI cases (appendix 1). The sample was restricted to those enrolled in fee-for-service Medicare, living in the community pre-injury, with an IRF-PAI admission assessment.

Study outcome

The primary study outcome was successful community discharge, defined as a discharge from the IRF to the community with no admission to an inpatient health care facility or death for 30 days after discharge. If individuals died during the IRF stay or the subsequent 30 days, were discharged to the hospital or a Skilled Nursing Facility (SNF), or were discharged home and then were admitted to a health care facility, they were not considered successfully discharged successfully discharged.

Predictor variables

Candidate variables included sociodemographic, pre-injury, and injury characteristics hypothesized to affect successful discharge. Sociodemographic characteristics included age, sex (male and female), race (black, white, other/unknown), and dual Medicaid/Medicare enrollment from the MBSF. Marital status (currently married, not currently married) and pre-injury living arrangements (living alone, not living alone) were obtained from the IRF-PAI. A count of pre-injury chronic conditions (with all cancer diagnoses collapsed into a single diagnosis; range 0-20) were obtained from the Chronic Conditions Warehouse. Functional Independence Measure (FIM) from the IRF-PAI reflected motor and cognitive status. The FIM includes ratings of 13 motor items (eg, eating, grooming, bathing, dressing (upper and lower body), toileting, bladder and bowel management, transfers, locomotion, stairs) and 5 cognitive items (comprehension, expression, social interaction, problem-solving, memory) rated on a 1 (dependent) to 7 (independent) scale. Injury characteristics obtained from the NTDB included the mechanism of injury (fall, motor vehicle, other/unknown), Glasgow Coma Scale (GCS) scores from the emergency department and categorized into mild (13-15), moderate (9-12), and severe (3-8), and worst head injury using the Abbreviated Injury Scale’s (AIS) 1 (minor) to 6 (maximal) point scale. For the GCS and AIS scores, not applicable and not recorded responses were collapsed into an “other” category. Additionally, we included variables reflecting non head injuries (≥AIS 2) and an intensive care unit admission.

Analyses

The linked NTDB and Medicare data were used for all analyses. We used a multiple imputation approach to account for potential errors in the linkage process. Using this approach, we created 30 datasets from the posterior distribution of the linkage algorithm, each of which contained linked records that represent the same patient. These linkage structures are sampled from the Bayesian linkage model based on 1000 Markov chain Monte-Carlo iterations with 250 burn-in iterations. To ensure that the linkage structures are independent, we used every 25th iteration to impute the missing linkage structure. Each dataset was analyzed separately, and then multiple imputation combining rules were used to obtain point and interval estimates. Specifically, for the statistic of interest \( \theta \), let \( \hat{\theta}^{(m)} \) be its estimate at linked data \( m \) be and \( U^{(m)} \) its corresponding standard error. The point estimates for \( \hat{\theta} \) is \( \hat{\theta} = \frac{1}{m} \sum_{m} \hat{\theta}^{(m)} \), and the corresponding sampling variance is \( T = U + 1 + \frac{1}{m}B \), where \( U = m \sum_{m} U^{(m)} \) and \( B = \frac{1}{m} \sum_{m} \left( \hat{\theta}^{(m)} - \hat{\theta} \right)^2 \). These combining rules were used to generate interval estimates for the area under the curve (AUC) and model parameters. All analyses were completed with Stata 16.0 Software. Additional details and code describing the analyses can be found at Brown Digital Repository: https://doi.org/10.26300/q8bq-qb54.

We describe the sample using estimated means and proportions. We use bivariate logistic regression to examine the unadjusted association between each potential predictor and the odds of successful discharge. We then use a 2-level hierarchical logistic regression model to evaluate the relationship between the predictors and successful discharge. We adjusted for sociodemographic, pre-injury, and injury
characteristics at the first level and IRF facility at the second level to account for additional variability in IRF facilities that could affect successful discharge. To identify a parsimonious model, we relied on a backward elimination algorithm with Rubin’s Rule Wald statistics. This method was shown to preserve the type 1 error rate. In short, this method begins by estimating in each imputed dataset the full model that includes all first-level candidate predictor variables. Pooled Wald statistics across imputed datasets are calculated using Rubin’s Rule for all of the coefficients in the model. The coefficient with the largest P value using the pooled Wald statistic is removed from the model, and the procedure is repeated with the reduced model. The procedure concludes when all of the coefficients in the model are significantly different from zero at the 0.05 level.

We report the odds ratio for each variable in the final model, and use the mimrgns Stata module to calculate the predicted probability of successful discharge. We calculate the AUC as described above to compare the discriminatory ability of the full and final model.

Results

The sample included a mean of 1060 (standard deviation 332) older adults with TBI across the 30 datasets, 64.6% (95% confidence interval [CI]: 61.0-68.3) of whom successfully discharged home. The mean age was 79.7 years, and most were men (55.7%), white (91.0%), and had mild injuries (82.3%). Additional details are provided in table 1. In the bivariate analyses, living alone pre-injury (odds ratio [OR]: 0.58, 95% CI: 0.41, 0.81), history of Alzheimer’s disease or dementia (OR: 0.64, 95% CI: 0.42, 0.98), prior inpatient post-acute care use (OR: 0.55, 95% CI: 0.32, 0.95), and number of pre-injury chronic conditions (OR: 0.95, 95% CI: 0.91, 0.99) were associated with a lower likelihood of successful discharge. Being married (OR: 1.44, 95% CI: 1.01, 2.07) and higher admission Functional Independence Measure-Motor (FIM-M; OR: 1.08, 95% CI: 1.06, 1.09) and Functional Independence Measure-Cognitive (FIM-C; OR: 1.10, 95% CI: 1.07, 1.13) were associated with higher odds of successful discharge. Complete results are provided in table 2.

The final model included 4 variables, living alone before injury, number of chronic conditions, and admission FIM-M and FIM-C scores (table 3). Living alone compared with not living alone (OR: 0.44, 95% CI: 0.28-0.68) and a higher number of chronic conditions (OR: 0.94, 95% CI: 0.90-0.99) were significantly associated with lower odds of successful discharge, whereas higher (better) scores on the FIM-M (OR: 1.07, 95% CI: 1.05-1.09) and FIM-C (OR: 1.05, 95% CI: 1.01, 1.08) were associated with higher odds of successful discharge. The ability to discriminate successful discharge was similar for the full model (AUC: 0.78 [95% CI: 0.74-0.82]) and the final four-predictor model (AUC: 0.76 [95% CI: 0.72-0.81]).

Figure 1 reflects the predicted probability of successful discharge from the final model, based on FIM-M score and pre-injury living arrangements (living alone or not living alone) with FIM-C and chronic conditions held at the mean. As observed in figure 1, individuals with higher FIM-M scores have a higher probability of successful discharge, as do those who lived with others before injury. For example, individuals who lived with others with FIM-M scores of 26 (maximum assistance across all items), 39 (moderate assistance across all items), and 52 (minimum assist across all items) would have 62%, 80%, and 90% probabilities of successful discharge, respectively. Individuals with the same FIM-M scores26,39,52 who lived alone would have 43%, 64%, and 80% probabilities of successful discharge home, respectively. However, the benefit of living with others diminishes as the admission FIM-M score increases.

Figure 2 reflects the predicted probability of successful discharge based on the FIM-C score and pre-injury living arrangements with FIM-M and chronic conditions held the mean. As reflected in figure 2, a higher FIM-C score and living with others vs living alone is associated with a higher probability of successful discharge. For individuals who lived alone, a FIM-C score of 10 (maximum assist across all items) was associated with a 46% probability of successful discharge, whereas a score of 20 (minimum assist across all items) was associated with a 56% probability of successful discharge.

### Table 1 Patient and injury characteristics

| Characteristics                          | Full Sample Estimate (95% CI) |
|------------------------------------------|-------------------------------|
| n, mean                                  | 1060 (332)                    |
| Age, y, mean                             | 79.7 (78.9, 80.6)             |
| Women, %                                 | 44.3 (40.2, 48.6)             |
| Race, %                                  |                               |
| White                                    | 91.0 (88.4, 93.5)             |
| Black                                    | 3.8 (2.3, 5.3)                |
| Other                                    | 5.2 (3.3, 7.2)                |
| Currently married, %                     | 55.2 (51.3, 59.1)             |
| Lived alone, %                           | 30.0 (26.4, 33.6)             |
| Medicare and Medicaid Enrolled, %        | 10.0 (7.9, 12.3)              |
| Number of pre-injury chronic conditions, mean | 8.8 (8.4, 9.2)                |
| Pre-Injury Alzheimer disease or dementia, % | 20.5 (17.5, 23.4)             |
| Prior inpatient PAC use                   | 9.2 (7.2, 11.2)               |
| Mechanism, %                             |                               |
| Fall                                     | 75.7 (71.6, 79.8)             |
| Motor vehicle                            | 17.1 (13.6, 20.6)             |
| Other/unknown                            | 7.2 (5.1, 9.2)                |
| GCS,* %                                  |                               |
| Mild (13-15)                             | 82.3 (78.6, 86.2)             |
| Moderate (9-12)                          | 4.4 (2.8, 6.0)                |
| Severe (3-8)                             | 6.5 (4.4, 8.6)                |
| AIS-Head-Max,* %                         |                               |
| 1                                        | 7.0 (4.6, 9.3)                |
| 2                                        | 11.4 (7.4, 15.5)              |
| 3                                        | 17.5 (13.5, 21.4)             |
| 4                                        | 48.5 (44.0, 53.0)             |
| 5                                        | 14.1 (10.1, 18.2)             |
| Intensive care admission, %              | 80.2 (76.9, 83.6)             |
| Non-head injury, %                       | 50.0 (45.5, 54.5)             |
| FIM-Motor, mean                          | 33.3 (32.3, 34.4)             |
| FIM-Cognitive, mean                      | 18.4 (17.8, 18.9)             |

* Excluding “not applicable/not documented” category.
Discharge. Among those living with others, the same scores were associated with a 63% and 72% probability of successful discharge, respectively.

Discussion

In a sample of older adults with TBI admitted to IRF for post-acute care, 64.7% successfully discharge home at the end of the IRF stay. A model including 4 predictor variables: FIM-M score, FIM-C score, number of chronic conditions, and living arrangements (living alone vs not alone) had acceptable discrimination of successful discharge that was similar to a larger model that included many clinical and demographic

| Characteristics                      | Not Successful Discharge | Successful Discharge | Est. Odds Ratio (95% CI) | P Value |
|--------------------------------------|--------------------------|----------------------|--------------------------|---------|
| Age, y, mean                         | 80.4 (79.4, 81.5)        | 79.3 (78.3, 80.3)    | 0.98 (0.96, 1.00)        | 0.06    |
| Women, %                             | 42.0 (35.4, 48.5)        | 45.7 (40.3, 51.1)    | 1.17 (0.82, 1.65)        | 0.38    |
| Race, %                              |                          |                      |                          |         |
| White                                | 92.1 (88.6, 95.7)        | 90.3 (87.2, 93.5)    | Ref.                     | 0.72    |
| Black                                | 3.4 (1.0, 5.8)           | 4.0 (2.0, 5.9)       | 1.19 (0.48, 2.93)        |         |
| Other                                | 4.4 (1.7, 7.2)           | 5.7 (3.3, 8.1)       | 1.32 (0.63, 2.82)        |         |
| Currently married, %                 | 49.6 (42.5, 56.7)        | 58.3 (53.4, 63.2)    | 1.44 (1.01, 2.07)        | 0.05    |
| Lived alone, %                       | 37.6 (31.6, 43.7)        | 25.9 (21.6, 30.1)    | 0.58 (0.41, 0.81)        | <0.01   |
| Medicare and Medicaid eligible, %    | 13.2 (9.0, 17.4)         | 8.4 (5.7, 11.1)      | 0.60 (0.38, 1.10)        | 0.06    |
| Number of pre-injury chronic conditions, mean | 9.3 (8.9, 9.8)        | 8.5 (8.0, 9.1)       | 0.95 (0.91, 0.99)        | 0.02    |
| Pre-injury Alzheimer’s disease or dementia, % | 25.4 (19.7, 31.0) | 17.8 (14.1, 21.5) | 0.64 (0.42, 0.98) | 0.04 |
| Prior PAC use, %                     | 12.6 (8.4, 16.8)         | 7.4 (5.0, 9.7)       | 0.55 (0.32, 0.95)        | 0.03    |
| Mechanism, %                         |                          |                      |                          |         |
| Fall                                 | 75.7 (69.6, 81.9)        | 75.7 (70.8, 80.7)    | Ref.                     | 0.98    |
| Motor vehicle                        | 16.9 (11.7, 22.0)        | 17.3 (13.1, 21.4)    | 1.02 (0.66, 1.58)        |         |
| Other/unknown                        | 7.4 (3.9, 10.8)          | 7.0 (4.3, 9.7)       | 0.95 (0.48, 1.87)        |         |
| GCS, %                               |                          |                      |                          | 0.80    |
| Mild (13-15)                         | 81.6 (76.3, 86.9)        | 82.8 (78.2, 87.4)    | Ref.                     |         |
| Moderate (9-12)                      | 3.7 (1.3, 6.2)           | 4.8 (2.7, 6.9)       | 1.28 (0.57, 2.91)        |         |
| Severe (3-8)                         | 5.9 (2.6, 9.2)           | 6.8 (4.2, 9.5)       | 1.15 (0.55, 2.44)        |         |
| AIS-Head-Max,* %                     |                          |                      |                          | 0.97    |
| 1                                    | 6.8 (3.3, 10.3)          | 7.0 (3.9, 10.2)      | Ref.                     |         |
| 2                                    | 11.3 (5.6, 17.1)         | 11.5 (7.3, 15.6)     | 0.99 (0.41, 2.36)        |         |
| 3                                    | 16.8 (11.5, 22.1)        | 17.9 (12.9, 23.1)    | 1.03 (0.47, 2.50)        |         |
| 4                                    | 48.9 (41.8, 55.8)        | 48.3 (42.9, 53.7)    | 0.95 (0.46, 1.97)        |         |
| 5                                    | 13.6 (8.3, 19.0)         | 14.4 (9.9, 18.9)     | 1.02 (0.45, 2.30)        |         |
| Intensive care admission, %          | 79.9 (74.5, 85.3)        | 80.4 (76.2, 84.6)    | 1.03 (0.67, 1.57)        | 0.90    |
| Non-head injury, %                   | 48.4 (40.8, 55.9)        | 50.9 (45.2, 56.6)    | 1.11 (0.76, 1.62)        | 0.60    |
| FIM-Motor, mean                      | 26.6 (25.2, 28.1)        | 37.0 (35.7, 38.3)    | 1.08 (1.06, 1.09)        | <0.01   |
| FIM-Cognitive, mean                  | 15.3 (14.2, 16.4)        | 20.0 (19.3, 20.8)    | 1.10 (1.07, 1.13)        | <0.01   |

Abbreviations: AIS, abbreviated injury scale score; FIM, functional independence measure; GCS, Glasgow coma scale score.

* Results exclude the “not applicable/not documented” category. Bold indicates a significant difference at P<0.05.

| Table 3 | Results from the final multivariable model predicting successful discharge |
|---------|--------------------------------------------------------------------------|
|         | Est. Odds Ratio (95% CI) |
| Lived alone | 0.44 (0.28, 0.68) |
| Number of chronic conditions | 0.94 (0.90, 0.99) |
| FIM-Motor score | 1.07 (1.05, 1.09) |
| FIM-Cognitive score | 1.05 (1.01, 1.08) |

NOTE. Final model AUC=0.76 (95% CI: 0.72, 0.81).
Abbreviation: FIM, functional independence measure.

Fig 1  Probability of a successful discharge by admission FIM-motor scores, stratified by pre-admission living arrangement.
characteristics. Notably, markers of acute injury severity at admission (AIS scores, GCS, scores, intensive care unit use) did not display an association with successful discharge. While it is clinically reasonable to expect fewer chronic conditions and higher admission motor and cognitive function would be associated with returning home, it is informative that these characteristics, combined with living arrangement, provided acceptable discrimination of successful discharge.

In interpreting these results, we consider pre-injury living arrangement to be a proxy for post-discharge at home support, as most individuals returning home would likely return to their pre-injury environment. Given this interpretation, the association between living arrangement and the ability to successfully return home highlights the critical importance of family and social support in discharge planning. Our findings demonstrate the extent to which family and caregivers are relied upon to provide ongoing care to individuals with TBI who would not otherwise be able to return home. Of course, in individual cases, close involvement with potential caregivers is critical in understanding their availability and capabilities for providing the required care.

Our findings align with our previous work, which identified a significant association between functional and cognitive status and successful discharge among older adults with TBI in SNF settings. The significant role of functional status and caregiver support or marital status has similarly been observed in individuals with stroke and adults with TBI across age groups. The relation between the number of chronic conditions is consistent with literature identifying the high prevalence and negative effect of chronic conditions on acute and post-acute outcomes in individuals with TBI. Finally, our findings support literature that suggests positive outcomes for most of older adults who receive care in IRFs, despite anecdotal concern older adults’ tolerance of rehabilitation-intensive IRF settings. However, individuals with post-acute care needs may alternatively be admitted to SNFs, or long-term acute care hospitals. Post-acute care episodes may include 1 or multiple of these settings. Despite differences between these levels of care, there is significant overlap in the patient populations served without clear guidance to inform selection of the most appropriate post-acute setting for a particular patient. In light of efforts to control Medicare post-acute care spending, additional work is needed to explore the effectiveness of the varied post-acute care options for older adults with TBI.

Study limitations

Our study has several limitations. First, to analyze the linked data, we assume that the linkage is non-informative, meaning that variables that are unique to each data file do not contribute to the linkage. Whereas this assumption is commonly made when using linked files, use of weakly informative variables for the linkage may result in violation of this assumption. Higher quality links increase the likelihood of meeting the non-informative linkage assumption. Thus, our linkage process included many patient-level and hospital-level variables to increase the quality of the links. Additionally, we used multiple imputation methods to account for potential errors in the linkage.

Second, in the included study years (2011-2015), the FIM measure was collected as part of the IRF-PAI assessment. However, as of October 2019, the FIM was replaced with the cross-setting “Section GG.” As a result, the specific FIM scores associated with the probability of successful discharge may have less utility. However, we believe that the relations observed between the motor and cognitive abilities and successful discharge, previously measured by the FIM and now reflected in “Section GG,” remain clinically informative.

Third, our model only included characteristics available in our data sources. For example, we did not have information on pre-injury functional status that may be related to both sustaining a TBI and admission function. Additional research into other characteristics could improve our model and the ability to predict successful discharge among this population. We also used a backward elimination procedure to identify a parsimonious model which may result in overfitting. However, previous variable selection studies with multiple imputation have shown that this method preserved the type 1 error and produced a prognostic model with good performance in an independent validation sample. Moreover, our final model is relatively small and includes only 4 variables.

It should be noted that we selected the term “successful discharge” to align with terminology used by Centers for Medicare and Medicaid Services and other investigations of post-acute care outcomes. However, achieving a successful discharge directly from an IRF is not the only pathway for an older adult with TBI to have a successful outcome. Given the multiple options for post-acute care individuals who do not discharge directly from IRF may do so after additional care in a subsequent setting.

Finally, our sample was limited to older adults hospitalized with TBI, enrolled in fee-for-service Medicare, who received acute care in an NTDB-participating Trauma Center (considered representative of Level I and II trauma centers) with dedicated burn beds. Burn beds are often in larger trauma facilities and certified burn centers that have resources and infrastructure to support resource intensive care. Thus, our results may not be generalizable to individuals who are enrolled in Medicare.
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Advantage, received acute care at a Level III or IV trauma center, or a facility without burn beds, or received other types of post-acute care. Additionally, the sample was predominantly comprised white beneficiaries. Although this is consistent with other samples of older adults with TBI in IRFs, the low proportion of non-white individuals limited our ability to examine differences in discharge disposition across more specific racial and ethnic groups.

Conclusions

Among the growing population of older adults with TBI in IRFs, most successfully return home after IRF discharge. We examined a variety of demographic, health, and injury characteristics and found that admission motor and cognitive abilities, chronic conditions, and living arrangement significantly predict successful discharge home. Knowledge of the relation between these 4 variables and the successful discharge outcome may be helpful to clinicians working with patients and families to develop discharge plans. The significant role of living arrangement, interpreted as a proxy for social support, speaks to the importance that family and caregivers play in helping patients return home and remain home. Our results, along with evidence suggesting high levels of stress, burden, and unmet needs among informal caregivers of individuals with TBI, highlight the importance of caregiver training and continued research into effective strategies for supporting caregivers during the transition home and after.

Suppliers

StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX: StataCorp LLC.

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