Incidence of Adult (≥40y) Traumatic Brain Injury and Likelihood of Routine Discharge: Do Co-Morbidities Matter?

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Background

Intracranial bleeding as a result of trauma is a known cause of morbidity and mortality among adults.[1] The current literature demonstrates an association between both size and presence of intracranial hemorrhage and its effects on mortality; however, it does not readily address the morbidity and associated functional outcomes of those who survive.[2] There are various methods in practice to help predict functional outcome in patients who suffer traumatic brain injury (TBI).[3] This study aims to demonstrate the prevalence of various types of TBI in adult patients admitted to trauma services and the association between the presence of TBI and the discharge disposition of these patients. This retrospective analysis will show the prevalence of TBI among different age groups according to bleed type and the length of stay and discharge disposition of these patients. It is often difficult for families to make decisions regarding post-acute placement of family members who have suffered traumatic brain injuries.[4] The use of palliative care services for goals of care discussions in trauma patients has become increasingly more common; however, it is still underutilized, particularly in geriatric trauma situations where the outcome is likely to be poor.[5]

Objective

We hypothesize that the likelihood of discharge to home decreases with advancement of age in the presence of traumatic brain injury.

Methods

We retrospectively accessed a de-identified electronic database of trauma patients at a single level-1 trauma center within HCA Healthcare. Adult patients (age > 40 were included that were diagnosed with an TBI via ICD-10 codes between July 1, 2016 – Oct 31, 2021. Disposition to home without services was the dependent variable. Injuries, causes, and procedures were also extracted via ICD-10 codes. Additional diagnostic and injury severity scoring was done using the AIS system.

A logistic regression was performed to ascertain the effects of predictor variables on the likelihood that an adult TBI patient who experienced a routine disposition. Statistics were performed with SPSS-28, alpha = 0.05. Descriptive statistics were done with means ± standard deviations.

This project was determined to be exempt from IRB oversight.

Study period

July 1, 2016 to October 31, 2021

Inclusion Criteria

Based on age (≥ 40 years) and ICD10 diagnosis of ICH

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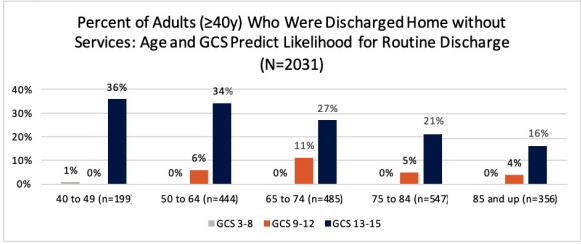
Results

Table 1. Logistic Regression Analysis of Adult (>40 years) Trauma Patients Diagnosed with an ICH, Inclusive Years July 1, 2016 to October 31, 2021 (N=2031)
Outcome/Dependent Variable: Discharged Home Without Care (Routine Discharge)

	B	S.E	Wald	df	Sig.	Exp(B)
Age	-0.05	0.00	76.51	1	**<0.01**	0.94
Gender (F)	-0.27	0.12	4.99	1	**0.02**	0.75
Mode of Arrival						
Ground	-0.50	0.16	9.90	1	**<0.01**	0.60
HEMS	-0.52	0.45	1.32	1	0.25	0.59
Private Vehicle/Walk-In	0.33	0.28	1.36	1	0.24	1.39
Unknown			baseline			
Trauma Activation						
Full	-0.51	0.21	5.76	1	**0.01**	0.59
Partial	-0.08	0.15	0.28	1	0.59	0.91
Consult			baseline			
None	0.26	0.47	0.30	1	0.58	1.29
ISS	-0.07	0.01	49.41	1	**<0.01**	0.92
GCS	0.10	0.02	15.81	1	**<0.01**	1.10
Shock Index Ratio	-0.26	0.38	0.46	1	0.49	0.76
Hospital Length of Stay in Days	-0.15	0.01	81.41	1	**<0.01**	0.85
Pre-existing Comorbidity						
Advanced Directive Limiting Care	-0.33	0.26	1.65	1	0.19	0.71
Alcohol Use Disorder	-0.14	0.26	0.27	1	0.59	0.86
Anticoagulation Therapy/Bleeding Disorder	0.01	0.15	0.00	1	0.94	1.01
Cerebral Vascular Accident	-0.66	0.27	5.76	1	**0.01**	0.51
Cirrhosis	0.05	0.52	0.00	1	0.92	1.05
Cardiac: CHF/MI/PAD	-0.29	0.24	1.45	1	0.22	0.74
COPD	-0.60	0.23	6.60	1	**0.01**	0.54
Chronic Renal Failure	-0.51	0.44	1.32	1	0.25	0.59
Current Smoker	0.27	0.22	1.46	1	0.22	1.31
Dementia	-0.59	0.21	7.71	1	**<0.01**	0.55
Diabetes Mellitus	-0.31	0.15	3.99	1	**0.04**	0.73
Functionally Dependent Health Status	-0.07	0.24	0.08	1	0.77	0.93
Hypertension	0.17	0.13	1.77	1	0.18	1.19
Personality Disorders/ADD/ADHD	-0.43	0.22	3.54	1	0.06	0.65
Substance Use Disorder	-0.08	0.35	0.05	1	0.82	0.92
VTE Administration						
Unfractionated Heparin	-0.16	0.32	0.25	1	0.61	0.84
LMWH			baseline			
Xa Inhibitor	1.00	0.63	2.47	1	0.11	2.72
Other	-0.13	0.35	0.13	1	0.71	0.87
None	0.37	0.17	4.66	1	**0.03**	1.45
Constant	4.80	0.73	42.94	1	<0.01	121.45

- 2031 patients were included in the analysis
- Mean age (y ±: SD) = 70.69 ± 14.13
- 90% of patients were Caucasian (1823/2031)
- 43% were transferred in from referring facilities (878/2031)
- The mean injury severity score (ISS) was 16.29 ± 8.58.
- 99% of injuries were blunt trauma (2007/2031) and 73% were from falls (1501).
- The mean AIS body region injury score for the head was 3.44 ±1.03 and face 1.26 ± 0.45.
- This ICH adult population had a mean Glasgow Coma Score (GCS) of 13.06 ± 3.86 and shock index ratio of 0.58 ± 0.19.
- The morbidity descriptors identified a mean ICU length of stay of 4.63 ± 5.51 days, mean vent days 1.83 ± 5.82 days, and mean hospital length of stay of 6.17 ± 6.83 days.
- 43% were discharged home without care (837/2031).



Discussion

- This single-center study at a Level 1 trauma system demonstrated significant associations between adult TBI trauma patients and those that were discharged home without services. Significant sex and age differences were found in the sample population. As age increased by one year, the odds of being discharged home without care decreased by 6% (mean age = 70 ± 14).
- Female trauma patients who were diagnosed with TBI were 25% less likely to be discharged home without care compared to the male sex. The significant injury details in this population describes the fully activated TBI adult trauma patients as being 41% less likely to discharge home without care.
- Further, as the ISS increased by one unit (scale 1-75), the odds of being discharged home without care decreased by 8% (mean ISS = 16 ± 8)
- When considering neurological functioning on arrival, those TBI patients that presented with a higher GCS had increased odds of routine discharge to home without care
- This research found significant findings in morbidity and comorbidity markers among adults with ICH trauma
  - As hospital length of stay increased by one day, the odds of routine discharge decreased by 15%.
  - Further, there was a reduction in odds in routine discharge if the TBI trauma patient had a pre-existing comorbidity of CVA (49%), COPD (46%), dementia (45%), and diabetes (27%)

Conclusion

- Traumatic brain injury as a result of trauma is a known cause of morbidity and mortality among adults. In this project, those adult TBI trauma patients who were not likely to experience a routine discharge home without services had significant differences in sex, age, pre-existing comorbidities, injury details, and mortality markers. The correlative information from this study can be used in the future to assist with prognostication for patients admitted to trauma services to help facilitate goals of care discussions with patients and families

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