Validating Trauma-Specific Frailty Index for Geriatric Trauma Patients: A Prospective Analysis

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BACKGROUND: The Frailty Index has been shown to predict discharge disposition in geriatric patients. The aim of this study was to validate the modified 15-variable Trauma-Specific Frailty Index (TSFI) to predict discharge disposition in geriatric trauma patients. We hypothesized that TSFI can predict discharge disposition in geriatric trauma patients.

STUDY DESIGN: We performed a 2-year (2011−2013) prospective analysis of all geriatric trauma patients presenting to our Level I trauma center. Patient discharge disposition was dichotomized into unfavorable (discharge to skilled nursing facility or death) and favorable (discharge to home or rehabilitation center) discharge disposition. Patients were evaluated using the developed 15-variable TSFI. Multivariate logistic regression was performed to identify factors that predict unfavorable discharge disposition.

RESULTS: A total of 200 patients were enrolled for validation of TSFI. Mean age was 77 ± 12.1 years, median Injury Severity Score was 15 (interquartile range [IQR] 9 to 20), median Glasgow Coma Scale score was 14 (IQR 13 to 15), and median Frailty Index score was 0.20 (IQR 0.17 to 0.28); 29.5% (n = 59) patients had unfavorable discharge. After adjusting for age, sex, Injury Severity Score, Head Abbreviated Injury Scale, and vitals on admission, Frailty Index (odds ratio = 1.5; 95% CI, 1.1−2.5) was the only significant predictor for unfavorable discharge disposition. Age (odds ratio = 1.2; 95% CI, 0.9−3.1; p = 0.2) was not predictive of unfavorable discharge disposition.

CONCLUSIONS: The 15-variable TSFI is an independent predictor of unfavorable discharge disposition in geriatric trauma patients. The Trauma-Specific Frailty Index is an effective tool that can aid clinicians in planning discharge disposition of geriatric trauma patients.

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Geriatric patients have a decreased physiologic reserve and a unique physiologic vulnerability that makes clinical decision making in these patients challenging.[1,2] As the US population continues to age, there has been an increase in the number of geriatric patients requiring trauma care and admissions to our trauma centers.[2,3]

Predicting discharge disposition is an important component in the management of trauma patients and begins immediately after hospital admission. Early understanding of the discharge disposition can help in communication with family and mobilizing hospital resources. Several clinical assessment tools have been used to predict adverse outcomes in trauma patients, however, none of these taken into account the altered physiologic reserve in geriatric trauma patients.[4-9] In a previous study at our institution, we demonstrated that a 50-variable Frailty Index was an independent predictor of unfavorable discharge disposition in geriatric trauma patients.[2] Frailty Index was superior to age and Injury Severity Scores for assessing adverse outcomes. However, the

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Abbreviations and Acronyms
GCS = Glasgow Coma Scale
h-AIS = Head Abbreviated Injury Scale
ISS = Injury Severity Score
ROC = receiver operating characteristic
TSFI = Trauma-Specific Frailty Index

50-variable Frailty Index was an extensive and time-consuming questionnaire that was difficult to implement in the acute setting of trauma. To facilitate the clinical implementation of frailty in trauma, we developed a modified 15-variable Trauma-Specific Frailty Index (TSFI) using the variables from the 50-variable Frailty Index.

The aim of this study was to validate the modified 15-variable TSFI to predict discharge disposition in geriatric trauma patients. We hypothesized that TSFI can predict discharge disposition in geriatric trauma patients.

METHODS

After obtaining approval from the University of Arizona Institutional Review Board, we performed a 2-year (June 2011 to July 2013) prospective observational study of consecutive trauma patients older than 65 years presenting to our Level I trauma center. Only patients with in-hospital admission were included. Patients transferred from a rehabilitation center, skilled nursing facility, or other institutions, intubated or nonresponsive patients with or without family members for whom Frailty Index score could not be calculated, and patients who did not consent for enrollment were excluded.

Data points

We recorded the following data points for each patient: patient demographics (age, sex, race, and ethnicity); injury characteristics (type and mechanism of injury); vital parameters on presentation (Glasgow Coma Scale [GCS] score, systolic blood pressure, heart rate, temperature); hospital and ICU lengths of stay, and discharge disposition. The Injury Severity Score (ISS) and head Abbreviated Injury Scale (h-AIS) score were obtained from the trauma registry.

Outcomes measure

We categorized patients into 2 groups based on their discharge disposition: favorable discharge and unfavorable discharge. Favorable discharge was defined as discharge to home or rehabilitation center and unfavorable defined as discharge to a skilled nursing facility or in-hospital mortality. Our primary outcomes measure was unfavorable discharge disposition.

Development of Trauma-Specific Frailty Index

We enrolled 100 consecutive geriatric trauma patients using the 50-variable Frailty Index for development of the TSFI. Univariate analysis was performed to identify associations among variables in the 50-variable Frailty Index for development of unfavorable discharge disposition.[2] Fifteen variables with the strongest association for development of unfavorable discharge disposition were selected to develop the TSFI (Appendix; available online). We then enrolled 200 consecutive trauma patients aged older than 65 years to validate our Frailty Index.

Study protocol

Patients were approached by a single investigator on the first day of their hospital admission for enrollment in the study. After obtaining informed consent, the Frailty Index was calculated in each patient using the TSFI. In case of intubated or nonresponsive patients, the information was obtained from the patient's close relatives. The variables comprising the Frailty Index were explained to each patient and it was clarified that the Frailty Index questionnaire assessed the patient's pre-injury health condition.

Statistical analysis

Data are reported as the mean ± SD for continuous descriptive variables, median (interquartile range [IQR]) for ordinal descriptive variables, and the proportion for categorical variables. To analyze data, we used the Student's *t*-test for parametric variables and the Mann-Whitney U test for nonparametric variables. To assess the association between each variable and an unfavorable discharge disposition, we performed univariate analysis. Variables with a significant ($p < 0.2$) association per our univariate analysis were then used in a multivariate logistic regression model. On multivariate logistic regression analysis, variables were considered significant at $p \leq 0.05$. Receiver operating characteristic (ROC) curve analysis was used to identify the optimal TSFI cutoff point for development of unfavorable discharge disposition. For all of our statistical analyses, we used STATA Data Analysis and Statistical Software, version 11.0 (Stata Corp).

RESULTS

A total of 200 consecutive geriatric trauma patients were prospectively enrolled for validating the TSFI. Mean age was 77 ± 12.1 years, 72% (n = 144) were male, median ISS score was 15 (IQR 9 to 20), median h-AIS score was 2 (IQR 1 to 3), median GCS score was 14 (IQR 13 to 15), and median Frailty Index score was 0.20 (range 0.17 to 0.28).

A favorable discharge disposition was found in 70.5% (n = 141); and the remaining 29.5% (n = 59) had