Development of Internal Prediction Models to Assess Mortality and Discharge Disposition in Patients with Traumatic Brain Injuries in a Level II Trauma Center

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BACKGROUND

- This retrospective study was conducted using the St. Barnabas Hospital's (SBH -Level II ACS Verified Trauma Center) Trauma Registry.
- This data was collected from January 1, 2016 to December 31, 2019 comprising of 934 traumatic brain injury patients (TBIs).

OBJECTIVES

- To generate prediction models to assess the mortality and discharge disposition for survivors in patients with TBIs.

MATERIALS AND METHODS

- Models and statistical analyses were calculated using IBM SPSS Statistics, version 26.
- Logistic regression analysis was used to assess the impact of model variables on mortality and rehab discharge disposition in TBI patients, respectively.
- Model variables included age, race, ethnicity, gender, BMI, NISS, insurance, systolic and diastolic blood pressure, fall height, blunt or penetrating injury, supplemental oxygen, GCS, drug screen, cerebrovascular disease, hypertension, blood thinners, current smoker, alcohol use, and a modified Charleston index comorbidities.
- Discrimination (Area under the Receiver Operator Curve (AuROC)) and calibration (Hosmer-Lemeshow C-statistic (HL-C)) measured predictive capability.

Table 1. Study Demographics

Descriptive characteristics	2016-2019 (N = 934)
Gender	
Male	704
Female	230
Race	
White	387
Black	424
Other	123
Ethnicity	
Hispanic	339
Non-Hispanic	595
Insurance Status	
Public	594
Private	228
Out-of-Pocket	18
Other	94
Mortality	69
Rehab	135

RESULTS

- Final mortality prediction model included 843 TBI patients.
- Significant predictors for mortality included ED GCS Score, supplemental oxygen, NISS, and insurance.
- Final rehab discharge disposition prediction model included 780 TBI patients.
- Significant predictors for discharge disposition for survivors included ED GCS Score and NISS.

Table 2. Mortality Model Significant Variables

Mortality Prediction Variables	Pearson Chi-Square
ED GCS Score	0.000
Supplemental Oxygen	0.000
NISS	0.000
Insurance	0.001

Table 3. Rehab Model Significant Variables

Rehab Prediction Variables	Pearson Chi-Square
ED GCS Score	0.000
NISS	0.000

Table 4. Model Performance

Model	AuROC (95% CI)	L/H C-Statistic
A) Mortality	0.955	0.147
B) Rehab Disposition	0.857	0.541

ROC Curves
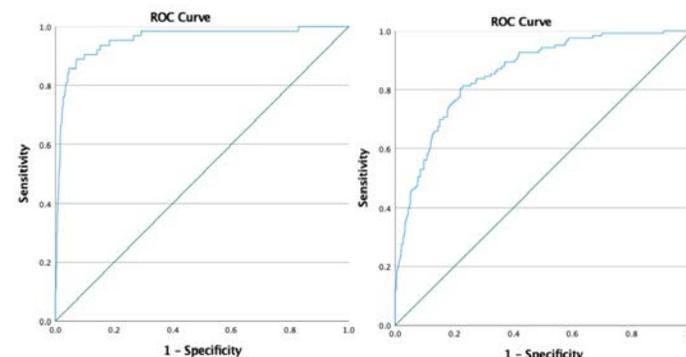
A

B

CONCLUSIONS

- LR using demographics, co-morbidities, and physiologic data provided good prediction models for mortality and rehab discharge disposition
- These models can be utilized for trauma service process improvement