Early Prediction of Length of Stay in Hospitalized Patients with Stroke and Traumatic Brain Injury

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Background

Stroke is one of the leading causes of morbidity and mortality worldwide, and traumatic brain injury (TBI) is one of the major causes of disability in children and young adults. ICU length of stay (LOS) is considered a primary driver of inpatient costs. The prediction of length of stay in the early phase of hospitalization can inform resource allocation and improve clinical decision-making to ultimately reduce medical spending.

Objectives

1. To use patient data available in the first 24 hours of stay to predict length of stay (LOS) for patients with traumatic brain injury and stroke in the Neuro Critical Care Unit (NCCU).
2. To identify and rank predictive features driving the LOS.

Methods

The JHU Precision Medicine Analytics Platform (PMAP) database was searched for adults admitted to the Neuro Critical Care Unit for management of stroke or TBI. Study subject selection process is shown in the flow diagram. Model performance was evaluated with measures of discrimination, precision, and calibration.

Results

The Glasgow Coma Scale (GCS) is the most important feature in predicting NCCU Length of Stay.

Different LOS Models

The best performing model is Support Vector Machine, which has information about TBI and stroke types as input features.

Conclusions

Accurate predictions about length of stay for NCCU can be made using patient data available in the first 24 hours. Considering an average cost of 4000$ per day in the NCCU, cost of stay can be estimated.

Future Scope

The models will be validated on external available ICU datasets. Quantification of length of stay may correlate with NCCU cost, and the complex relationship between the two may be quantified further.