## Spring 2023 Data Science Clinic NeuroCritical Care

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Neurotrauma surgeons presented with patients who have gunshot wounds to the head must make quick decisions regarding course of treatment based on the patients' current condition.

The University of Chicago Neurocritical Care collaborated with the Data Science Clinic to evaluate data from the National Trauma Database to guide doctors' decision making. This database comprises diverse patient data collected nationwide. The project specifically used Glasgow Coma Score (GCS) data to predict patient outcomes: favorable (they return home) or unfavorable (they die or enter hospice care). GCS measures consciousness on a scale ranging from 3 to 15. The total score is comprised of motor, verbal, and eye response components recorded by Emergency Medical Services (EMS) and during the patient's hospital stay.

The team found that for patients with GCS scores between 4 and 12, the most important predictor of patient outcomes were high verbal and low motor subscores. The second most predictive combination was improvements in GCS scores from EMS to the hospital. Figure 1 shows the predictive importance of three different combinations of GCS scores in the most predictive of the team's trained models. In Figure 1 the middle bars represent the predictive importance of the discrepancy in scores recorded between EMS and the hospital. The magnitude of the third set of bars indicates that a combination of motor and verbal subscores is the most significant predictor for final outcomes. These findings are further supported by Figure 2, illustrating that employing a combination of verbal and motor scores achieves a clear differentiation between favorable and unfavorable outcomes. Notably, these results maintained their significance even after accounting for patient sedation or intubation and across different model types.

These findings provide promising insights to help support doctor decision-making in prioritizing patient treatment in high-stakes life or death situations.



Sum of all Hospital-EMS Motor-Verbal

Fig 1. Contributions of the most important combinations of subscores to final outcomes



Fig 2. Prediction separation achieved through combination of motor and verbal subscores