Category :**Brain: Head trauma**

A243 - ***Computational subphenotypes of traumatic brain injury in the icu stratum***

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Introduction:

Heterogeneity represents a major barrier in efforts to find effective treatments for patients with moderate and severe traumatic brain injury (TBI). One approach to address heterogeneity might be to resolve undifferentiated populations into subphenotypes which would have greater intrinsic biological uniformity. We hypothesized that clinically meaningful subphenotypes can be identified using unsupervised computational approaches applied to electronic health records and physiological time series (PTS) data.

Methods:

Adult patients admitted to the ICU for management of TBI were selected from a multi-center database (eICU), and clinical, laboratory and physiological time series data were extracted. Unsupervised clustering algorithms were implemented accounting for mixed data types. Clusters were characterized according to outcome distributions at discharge, and differences in physiology. The clustering algorithm was validated externally on an analogous TBI population in an independent, single-center dataset (MIMIC-III).

Results:

Among 4,450 patients admitted to intensive care with TBI, we identified four clusters (a, b, c, d) each with a distinct outcome probability distribution, and each associated with unique, clinically relevant pattern of laboratory/PTS signatures. Subphenotype (a) captured TBI patients who had the highest likelihood of survival and favorable neurological outcome, while patients in subphenotype (d) had the highest risk of death and unfavorable neurological outcome. Results were reproduced in the MIMIC III cohort when eICU clusters were assigned using a multi-class classification (Figure 1).

Conclusion:

Using unsupervised machine learning, we identified four distinct and clinically meaningful clusters in a large sample of TBI patents admitted to the ICU. Patients assigned to specific clusters had distinct outcome probabilities and unique data signatures suggesting that they are plausible candidate subphenotypes.

Image :

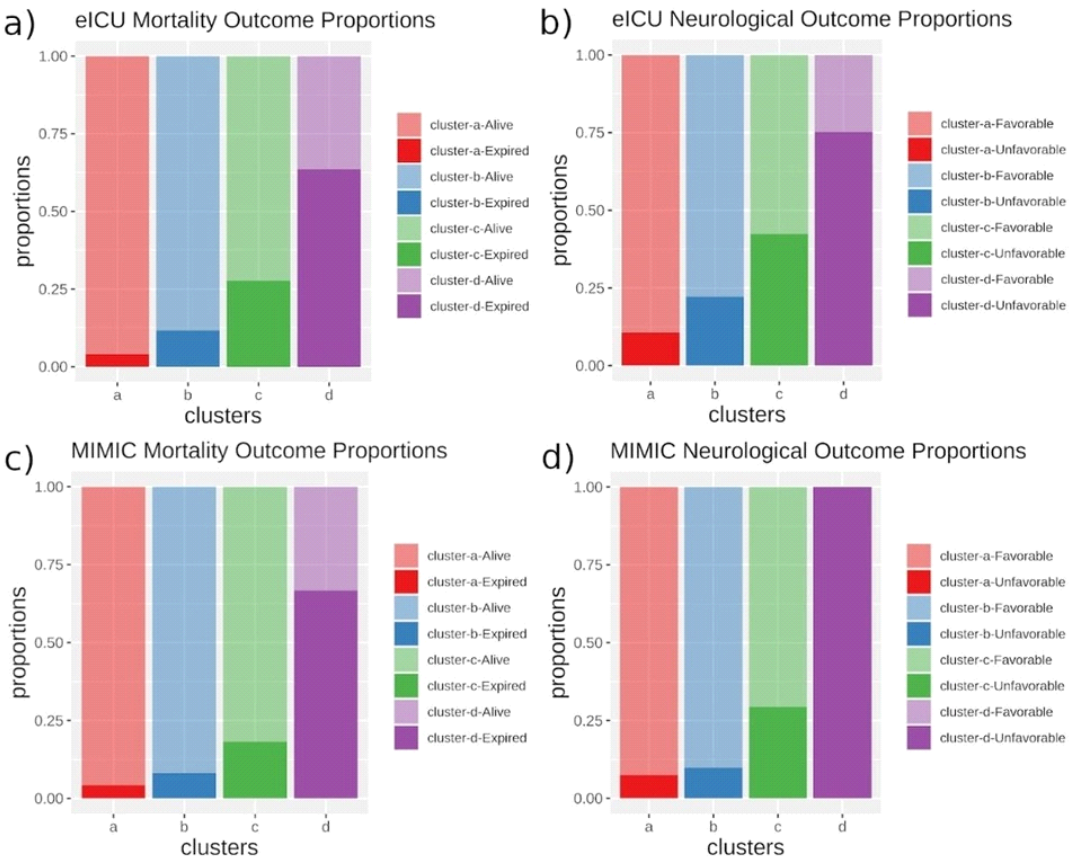

Figure 1. Mortality and Neurological Outcome Proportions corresponding to subphenotypes discovered in eICU (a, b) and externally validated in MIMIC III (c, d)