

Establishment of a Classifier Model for Early Prediction of Acute Delirium in Adult Intensive Care Unit Using Machine Learning

Authors : Pei Yi Lin

Abstract : Objective: The objective of this study is to use machine learning methods to build an early prediction classifier model for acute delirium to improve the quality of medical care for intensive care patients. Background: Delirium is a common acute and sudden disturbance of consciousness in critically ill patients. After the occurrence, it is easy to prolong the length of hospital stay and increase medical costs and mortality. In 2021, the incidence of delirium in the intensive care unit of internal medicine was as high as 59.78%, which indirectly prolonged the average length of hospital stay by 8.28 days, and the mortality rate is about 2.22% in the past three years. Therefore, it is expected to build a delirium prediction classifier through big data analysis and machine learning methods to detect delirium early. Method: This study is a retrospective study, using the artificial intelligence big data database to extract the characteristic factors related to delirium in intensive care unit patients and let the machine learn. The study included patients aged over 20 years old who were admitted to the intensive care unit between May 1, 2022, and December 31, 2022, excluding GCS assessment <4 points, admission to ICU for less than 24 hours, and CAM-ICU evaluation. The CAMICU delirium assessment results every 8 hours within 30 days of hospitalization are regarded as an event, and the cumulative data from ICU admission to the prediction time point are extracted to predict the possibility of delirium occurring in the next 8 hours, and collect a total of 63,754 research case data, extract 12 feature selections to train the model, including age, sex, average ICU stay hours, visual and auditory abnormalities, RASS assessment score, APACHE-II Score score, number of invasive catheters indwelling, restraint and sedative and hypnotic drugs. Through feature data cleaning, processing and KNN interpolation method supplementation, a total of 54595 research case events were extracted to provide machine learning model analysis, using the research events from May 01 to November 30, 2022, as the model training data, 80% of which is the training set for model training, and 20% for the internal verification of the verification set, and then from December 01 to December 2022 The CU research event on the 31st is an external verification set data, and finally the model inference and performance evaluation are performed, and then the model has trained again by adjusting the model parameters. Results: In this study, XG Boost, Random Forest, Logistic Regression, and Decision Tree were used to analyze and compare four machine learning models. The average accuracy rate of internal verification was highest in Random Forest (AUC=0.86), and the average accuracy rate of external verification was in Random Forest and XG Boost was the highest, AUC was 0.86, and the average accuracy of cross-validation was the highest in Random Forest (ACC=0.77). Conclusion: Clinically, medical staff usually conduct CAM-ICU assessments at the bedside of critically ill patients in clinical practice, but there is a lack of machine learning classification methods to assist ICU patients in real-time assessment, resulting in the inability to provide more objective and continuous monitoring data to assist Clinical staff can more accurately identify and predict the occurrence of delirium in patients. It is hoped that the development and construction of predictive models through machine learning can predict delirium early and immediately, make clinical decisions at the best time, and cooperate with PADIS delirium care measures to provide individualized non-drug interventional care measures to maintain patient safety, and then Improve the quality of care.

Keywords : critically ill patients, machine learning methods, delirium prediction, classifier model

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