THE KOREAN SOCIETY OF NEPHROLOGY
APCN & KSN 2024
June 13(Thu) - 16(Sun), 2024 Coex, Seoul, Korea
APSN
Promoting Sustainable Kidney Health: The Asia-Pacific and Beyond

Abstract Submission No.: A-0906

Establishment of machine learning-based risk prediction model for acute kidney injury after acute myocardial infarction

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Objectives : Acute kidney injury (AKI) is a common complication of acute myocardial infarction (AMI) with high morbidity, mortality and lack of effective treatment, so prevention is particularly important. This study intends to use machine learning to establish a precise prediction model for AKI after AMI.
Methods : AMI patients were consecutively collected from July 2011 to December 2016 in Beijing Anzhen Hospital, Capital Medical University. A predictive model (Model A) was then created using a multivariate logistic regression model, the prediction model (Model B) is created by machine learning algorithm. The algorithm includes MLP, SVM, KNN and SimpleRNN, from which the model with the largest area under the ROC curve (Model B) is selected and verified in the test set.
Results : A total of 6014 AMI patients were included in this study. The incidence of AKI in the overall population was 11.2% (674/6014). A total of 12 important characteristics were included in the model, including the number of myocardial infarctions, ST-segment elevation myocardial infarction, ventricular tachycardia, third-degree atrioventricular block, decompensated heart failure at admission, admission serum creatinine value, admission urea nitrogen value, admission CK-MB peak value, whether diuretics were used, maximum daily dose of diuretics, days of diuretic use, and whether statins were used. Logistic regression analysis resulted in an area under the ROC curve of 0.80 (95% CI, 0.76-0.84) in the test set (Figure 1). The models were constructed by MLP, SVM, KNN and SimpleRNN algorithms (Figure 2), and finally the model constructed by MLP algorithm was selected as model B, and its area under the ROC curve was 0.82 (95% CI, 0.78 – 0.85).
Conclusions : The prediction model of AKI risk after AMI based on machine learning technology has better discriminant ability and accuracy, which can provide an effective tool for early identification of these high-risk patients.

Figure 1.jpg

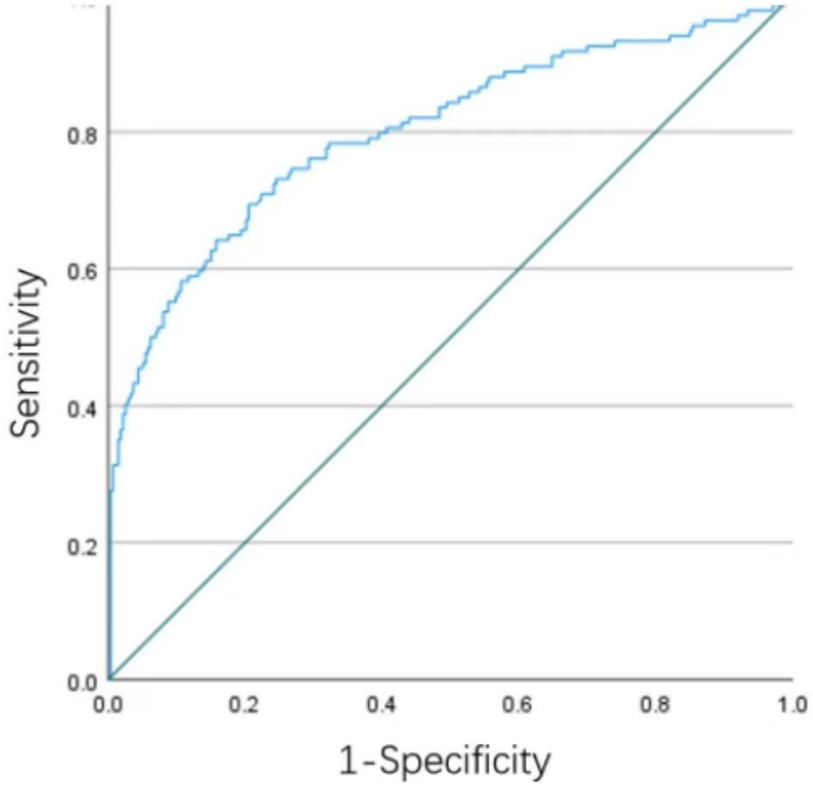
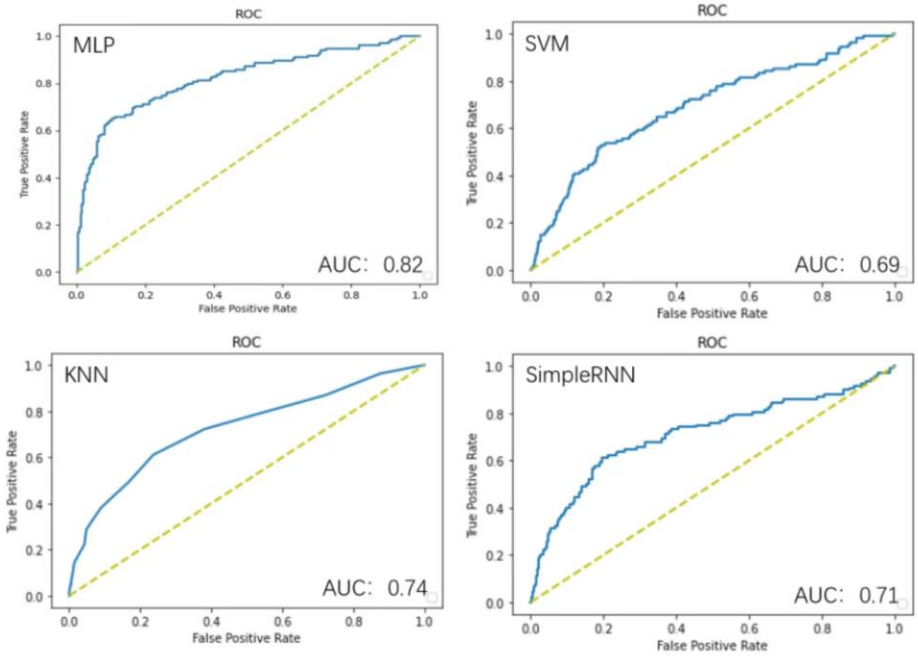

Sensitivity
1-Specificity
0.0
0.2
0.4
0.6
0.8
1.0

Figure 1.jpg


ROC
MLP
AUC: 0.82
ROC
SVM
AUC: 0.69
ROC
KNN
AUC: 0.74
ROC
SimpleRNN
AUC: 0.71
True Positive Rate
False Positive Rate