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Prediction of in-hospital bleeding for AMI patients undergoing PCI using machine learning method

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Background: Prediction of in-hospital bleeding is critical for clinical decision making for acute myocardial infarction (AMI) patients undergoing percutaneous coronary intervention (PCI). Machine learning methods can automatically select the combination of the important features and learn their underlying relationship with the outcome.

Objective: We aim to evaluate the predictive value of machine learning methods to predict in-hospital bleeding for AMI patients.

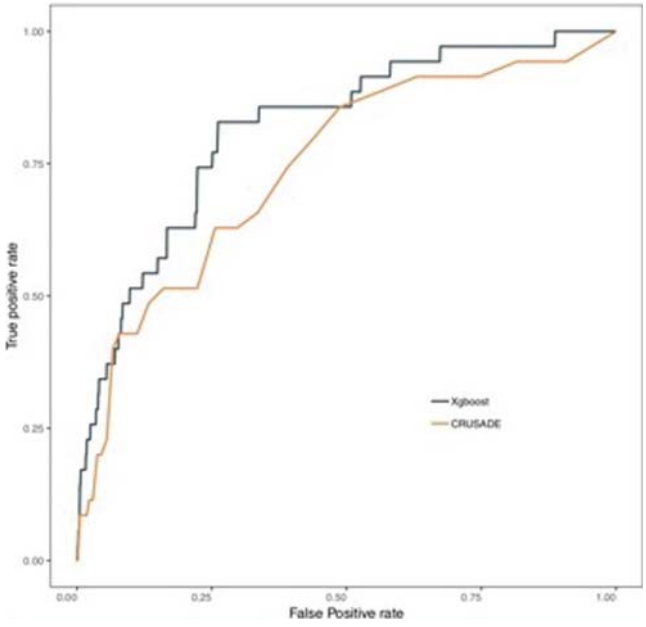
Methods: We used data from the multicenter China Acute Myocardial Infarction (CAMI) registry. We randomly partitioned the cohort into derivation set (75%) and validation set (25%). Using data from the derivation set, we applied a state-of-art machine learning algorithm, XGBoost, to automatically select features from 106 candidate variables and train a risk prediction model to predict in-hospital bleeding (BARC 3, 5 definition).

Results: 16736 AMI patients who underwent PCI were consecutively included in the analysis, while 70 (0.42%) patients had in-hospital bleeding followed the BARC 3,5 definition of bleeding. Fifty-nine features were automatically selected from the candidate features and were used to construct the prediction model. The area under the curve (AUC) of the XGBoost model was 0.816 (95% CI: 0.745–0.887) on the validation set, while AUC of the CRUSADE risk score was 0.723 (95% CI: 0.619–0.828).

Conclusion: The XGBoost model derived from the CAMI cohort accurately predicts in-hospital bleeding among Chinese AMI patients undergoing PCI.

Relative contribution of the 12 most important features

Feature	Relative Importance
Direct bilirubin	0.078
Heart rate	0.077
CKMB	0.076
Creatinine	0.064
GPT	0.052
Age	0.048
SBP	0.036
TG	0.035
Glucose	0.035
HCT	0.031
Total bilirubin	0.030
Neutrophil	0.030



ROC of the XGBoost model and CRUSADE