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P2479 Assessment of machine learning models in predicting all-cause mortality among hospitalised patients with bloodstream infection

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Background: Machine learning techniques have proved to be capable of predicting multiple clinical outcomes with satisfactory accuracy in real time. However, there remains a need to illustrate whether this advanced technique can accurately predict the mortality among hospitalized patients with bloodstream infection (BSI).

Materials/methods: This study was an investigative and predictive analysis based on the BSI patients' clinical data from the Chinese Antimicrobial Resistance Surveillance of Nosocomial Infections study. Multivariable logistic regression analysis was performed to identify independent risk factors for the BSI 28-day mortality. Seven separate machine learning models were developed using all clinical variables and compared for the discriminative performance in prediction of mortality. The area under the receiver operating characteristic curve (AUC) and a confusion matric were also calculated for each model.

Results: In total, the multivariate analysis showed that 17 study variables were independent risk factors for mortality among the BSI patients. The AUC of the seven machine-learning-based models were computed on the testing set, including random forest (AUC, 0.846), support vector machine (AUC, 0.817), multivariable logistic regression (AUC, 0.806), gradient boosting machine (AUC, 0.801), classification and regression tress (AUC, 0.743), Naive Bayes model (AUC, 0.681), and artificial neural networks (AUC, 0.637). In addition, the random forest model also performed best with the optimum specificity (0.74), the highest positive predictive value (0.32), and the optimum accuracy (0.74).

Conclusions: In this study, we demonstrate the utility of machine learning prediction model to accurately predict the mortality among hospitalized patients with the BSI. Integration of these advanced predictive analytics models into clinical decision support systems can provide clinicians with real-time prognostic information to assist decision-making and prevent the avoidable BSI from occurring.