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Promoting Sustainable Kidney Health: The Asia-Pacific and Beyond

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Prediction of acute kidney injury in trauma patients using extreme gradient boosting (XGBoost) model

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Objectives : Acute kidney injury (AKI) is a clinical syndrome characterized by a rapidly declining renal function, with an incidence of more than 10 to 20% in trauma patients. However, clinical recognition and management of AKI is often suboptimal, resulting from inadequate assessment of its risk factors. With the recent advances in machine learning models, AKI prediction models have shown improvements in accuracy. In the study, we aimed to develop and validate a predictive algorithm based on extreme gradient boosting (XGBoost) model for the early identification of AKI in trauma patients.
Methods : To train the AKI prediction model, we collected demographic information of a total of 17,900 trauma patients aged 18 years and older (from Jan 2015 to July 2023) with a hospitalization duration of 2 days or more, as well as records of 24 tests collected via blood and urine tests during hospitalization. The primary outcome of the study was the occurrence of AKI stage 1 to 3 after 48 hours. We organized the training and validation datasets in a 7:3 ratio to train the XGBoost model and measure its performance on the validation set.
Results : Validation of the trained XGBoost model showed that the AKI prediction AUROC after 48 hours was 0.9362, and the highest values of accuracy, sensitivity, specificity, and F1 score based on the classification threshold were 0.9401, 0.8464, 0.9788, and 0.7285, respectively.
Conclusions : Using the XGBoost model that predicts the future based on time series data, the AUROC, accuracy, specificity, and F1 score of the AKI incidence prediction model in trauma patients showed higher performance compared to conventional prediction models. Further studies are needed to confirm the efficacy of the model through prospective studies and clinical studies to show its effectiveness in the clinic to reduce the incidence of AKI.

그림 13.png

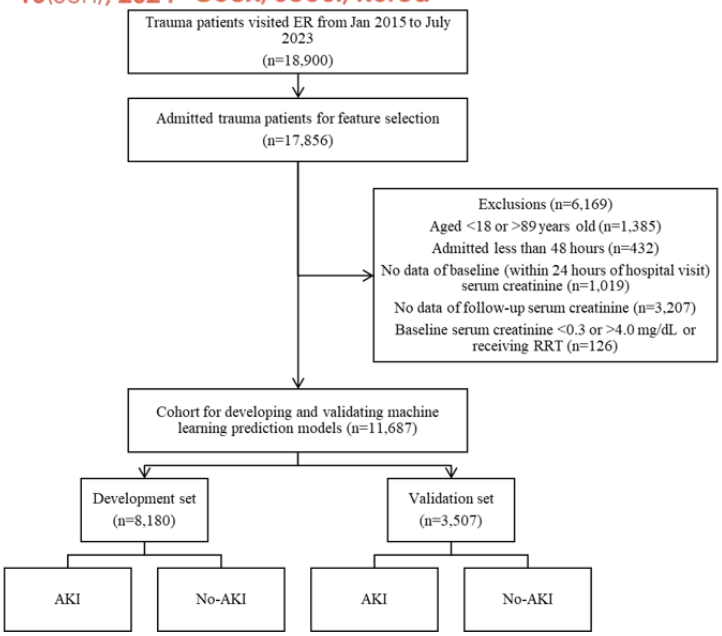
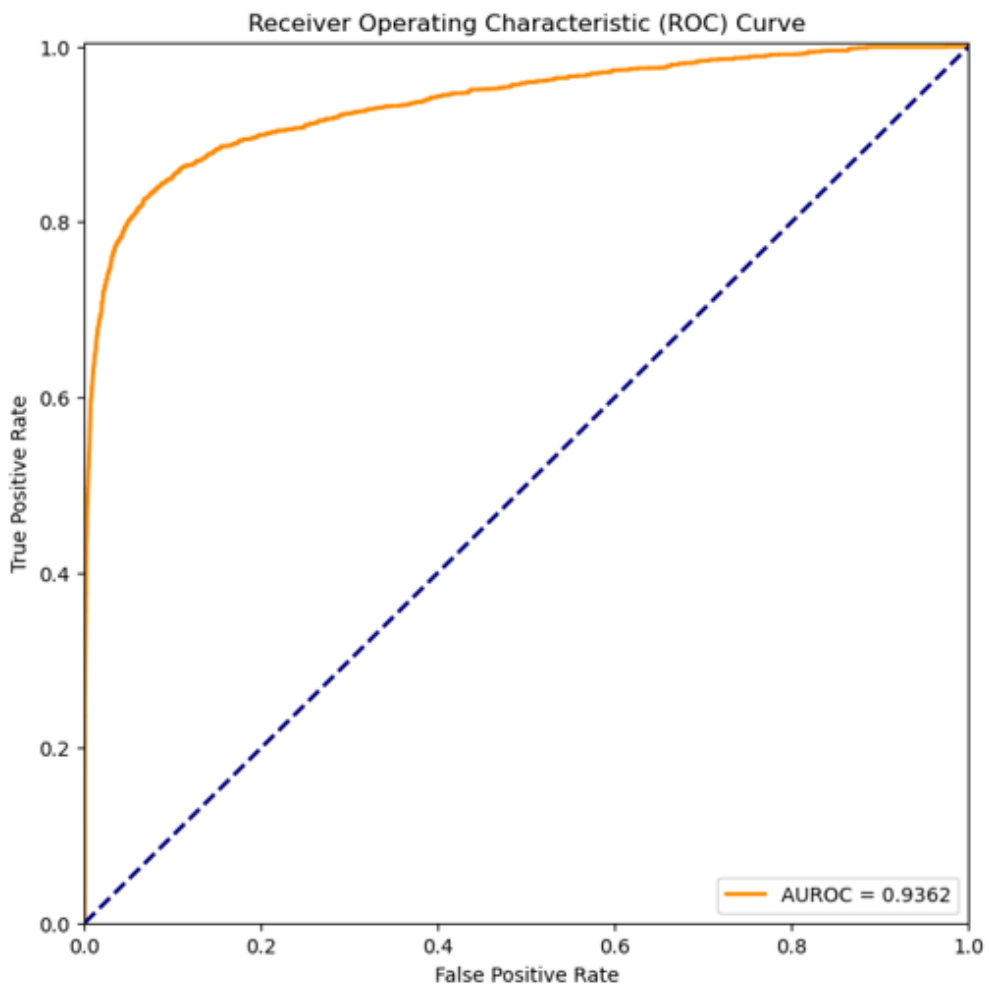

Trauma patients visited ER from Jan 2015 to July 2023
(n=18,900)
Admitted trauma patients for feature selection
(n=17,856)
Exclusions (n=6,169)
Aged <18 or >89 years old (n=1,385)
Admitted less than 48 hours (n=432)
No data of baseline (within 24 hours of hospital visit) serum creatinine (n=1,019)
No data of follow-up serum creatinine (n=3,207)
Baseline serum creatinine <0.3 or >4.0 mg/dL or receiving RRT (n=126)
Cohort for developing and validating machine learning prediction models (n=11,687)
Development set
(n=8,180)
Validation set
(n=3,507)
AKI
No-AKI
AKI
No-AKI

그림 13.png


Receiver Operating Characteristic (ROC) Curve
True Positive Rate
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
AUROC = 0.9362