KSN SEOUL, KOREA 2023
April 27(Thu) - 30(Sun), 2023
Coex, Seoul, Korea

Submission No.: KRFP-9152
Session Title: KSN Research Fund Project
Date & Time, Place: April 28 (Fri), 10:40 - 12:40, Room 4

Prediction of Intradialytic Hypotension Using Pre-dialysis Features – A Deep Learning Based Artificial Intelligence Model (CMC-IDH-X)

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Intradialytic hypotension (IDH) is a serious complication of hemodialysis (HD) associated with increased risks of cardiovascular morbidity and mortality. However, its accurate prediction remains a clinical challenge. The aim of this study was to develop a deep learning–based artificial intelligence (AI) model to predict IDH using pre-dialysis features. Data from 2,007 patients with 943,220 HD sessions at seven university hospitals were used. The performance of deep learning model was compared with 3 machine learning models (logistic regression, random forest, and XGBoost). IDH occurred in 5.39% of all studied HD sessions. A lower pre-dialysis blood pressure (BP), and a higher ultrafiltration (UF) target rate and interdialytic weight gain in IDH sessions compared to non-IDH sessions, and the occurrence of IDH in previous sessions was more frequent among IDH sessions compared to non-IDH sessions. Matthews correlation coefficient (MCC) and macro-averaged F1 score were used to evaluate both positive and negative prediction performances. Both values were similar in logistic regression, random forest, XGBoost, and deep learning models, developed with data from a single session. When combining data from the previous three sessions, the prediction performance of the deep learning model improved and became superior to that of other models. The common top-ranked features for IDH prediction were mean systolic BP (SBP) during the previous session, UF target rate, pre-dialysis SBP, and IDH experience during the previous session. Our AI model predicts IDH accurately, suggesting it as a reliable tool for HD treatment.