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Deep Neural Networks Trained on Dialysis Features Can Predict Mortality in ESRD Patients

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Objectives: Despite advances in dialysis, mortality in end-stage renal disease (ESRD) patients remains high. We aimed to evaluate whether deep neural networks trained on dialysis features can be used to build a predictive model for mortality in dialysis patients.

Methods: Data from a prospective, observational, multicenter cohort of 5,244 ESRD patients on dialysis in Korea (Clinical Research Center for End Stage Renal Disease, CRC for ESRD) was used to train and validate the algorithm. Eighty percent of the data was used to train the deep neural networks and 20% was used for testing. The networks were also compared to existing risk scores such as the modified Charlson comorbidity index and Davies comorbidity index, and predictive accuracy of the different models were presented using the highest area under the receiver operating characteristics curve (AUC).

Results: Highest predictive powers, AUC 0.72 (95% CI, 0.69 to 0.75), was observed in the model including the following risk factors: age, sex, BMI, blood pressure, total cholesterol, HDL, smoking, DM, history of cardiovascular disease, use of hypertensive medication, use of aspirin, LVH on ECG, and mode of dialysis. The modified Charlson comorbidity index and Davies comorbidity index had the highest AUC at 0.70 (95% CI, 0.68 to 0.72) and 0.64 (95% CI, 0.62 to 0.66), respectively.

Conclusions: Deep neural networks can be used to develop models to predict mortality in ESRD patients and these models are non-inferior to existing risk scores.