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Deep learning-based prediction model for postoperative AKI in major non-cardiac surgeries

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Objectives: Postoperative AKI is a common and critical condition in non-cardiac surgeries. A further deep learning-based prediction model for the occurrence of postoperative AKI is warranted.

Methods: We included 99,649 non-cardiac surgery cases from Seoul National University Hospital for the model development. Additional external validation was performed for 100,290 and 23,703 patients in Seoul National University Bundang Hospital and Seoul National University Boramae Medical Center, respectively. The study outcome was postoperative AKI defined by the creatinine-criteria of the KDIGO guideline identified from the peak creatinine levels within 7 days from operations. We used the "SAINT", a transformer-based deep-learning method which shows strength for tabular data problems, to construct the prediction model for AKI. The 80% of the study data selected from random-sampling was used for the model construction and the other 20% was included for the internal validation analysis. Total of 112 variables including demographic, operational, laboratory, and medical characteristics were included in the model.

Results: The study population had median age of 60 years old with median baseline eGFR 92.4 mL/min/1.73 m^2. The incidence of postoperative AKI was 5.79%, 5.46%, and 4.59% in the three hospitals, respectively. The constructed model showed acceptable performance [area under curve (AUC)=0.855] for the occurrence of postoperative AKI by the internal validation analysis. In addition, the model also showed acceptable discriminative power for postoperative AKI in Seoul National University Bundang Hospital (AUC=0.809) and in Seoul National University Boramae Medical Center (AUC=0.832), respectively.

Conclusions: The current study developed a deep learning-based prediction model for the occurrence of postoperative AKI after major non-cardiac surgery cases. The current model may be implemented in clinical practice considering the acceptable validation analysis results.