# Prediction of the Development of Dyskalemia in Inpatients: A Deep Learning Approach

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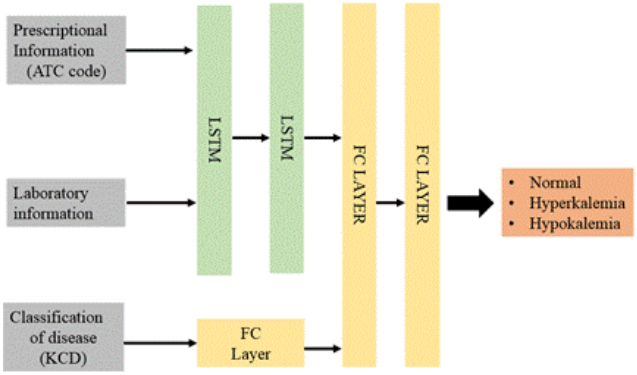
**Background/Aims:** Potassium disorders are common in various conditions such as renal impairment or drug adverse reactions, which can lead to fatal arrhythmia or sudden cardiac arrests. To prevent lethal complications accompanied by dyskalemia, we aimed to develop a deep learning based prediction model for hyperkalemia and hypokalemia using the recurrent neural network (RNN).

**Methods:** Data were retrieved from electronic records of patients with serum potassium levels measured more than once at National Health Insurance Service Medical Center, Ilsan Hospital from 2011 June to 2017 June. Features selected through Boruta algorithm included demographic information of sex and age, diagnosis, medications prescribed during hospitalization, and laboratory test results. Hypokalemia and hyperkalemia were classified as the serum potassium level less than 3.5 mEq/L and greater than 5.0 mEq/L, respectively. Prediction model was constructed with long short-term memory recurrent neural networks (LSTM-RNNs). To overcome the class imbalance between hyperkalemia and hypokalemia, we used oversampling before training the model. The final output was categorical variables predicting the development of dyskalemia within three days.

**Results:** In total, 115,658 patients were included for the analysis. Among the entire laboratory tests performed, hyperkalemia and hypokalemia occurred in 6.21% and 13.74%, respectively. A total of 78,762 cases in which serum potassium levels were examined more than once within 4 days were included in the analysis for the short-term prediction of dyskalemia. Modeling was performed with 68,373 cases as a training set. As a result of the validation using 10,389 cases, the accuracy was verified as 81.6%. However, the sensitivity of the model to predict each of hyperkalemia and hypokalemia was confirmed to be relatively low.

**Conclusions:** The deep learning-based model could moderately predict the development of dyskalemia using electronic records from inpatients.

Figure 1. Schematic representation of the deep learning model.




Note: ATC, Anatomical Therapeutic Chemical ; KCD, Korean Standard Classification of Diseases ; LSTM, long-short t memory; FC, f c.

Figure 2. Confusion matrix for predicting dyskalemia.