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# Deep Neural Network for Estimating Glomerular Filtration Rate

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**Objectives:** The glomerular filtration rate (GFR) is a typical method to estimate the patient's renal function status. Several methods have been proposed, including the Modification of Diet in Renal Disease (MDRD) method and the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation that is based on linear regression for estimating GFR. This study aimed to develop a deep neural network (DNN) to estimate GFR.

**Methods:** 241 patients were enrolled from Wonju Severance Christian hospital. All subjects measured DTPA Renogram, serum creatinine level. We constructed the DNN model composing three hidden layers: first, second, and third hidden layers included 40, 20, and 10 nodes. We determined the activation function of DNN as hyperbolic tangent. By using delta GFR (Measured GFR-Estimated GFR), Root squared error (RSE), P30, and accuracy of classification CKD patients (GFR < 60 mL/s per 1.73 $m^2$), the performance of DNN model was measured.

**Results:** Means of the median difference of MDRD, CKD-EPI, and DNN methods in five CV sets were 2.354 (– 0.75 to 6.92), 2.862 (– 1.12 to 7.98), and 1.866 (– 2.34 to 4.68), respectively. Averages of median RSE of MDRD, CKD-EPI, and DNN methods were 19.45, 18.9, and 16.78, respectively. In P30, MDRD showed the largest ratio among the three methods. In a classification of GFR < 60 mL/s per 1.73 $m^2$, means of the accuracy of MDRD, CKD-EPI, and DNN methods were 83.0, 84.3, and 85.1, respectively

**Conclusions:** By using DNN, we could proposed the most accurate estimated GFR in Korean patients.