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# Deep Learning Approach for Chronic Kidney Disease Complications

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**Abstract :** Quantification of risks associated with complications development from chronic kidney disease (CKD) through accurate survival models can help with patient management. A retrospective cohort that included patients diagnosed with CKD from a primary care program and followed up between 2013 and 2018 was carried out. Time-dependent and static covariates associated with demographic, clinical, and laboratory factors were included. Deep Learning (DL) survival analyzes were developed for three CKD outcomes: CKD stage progression, >25% decrease in Estimated Glomerular Filtration Rate (eGFR), and Renal Replacement Therapy (RRT). Models were evaluated and compared with Random Survival Forest (RSF) based on concordance index (C-index) metric. 2.143 patients were included. Two models were developed for each outcome, Deep Neural Network (DNN) model reported C-index=0.9867 for CKD stage progression; C-index=0.9905 for reduction in eGFR; C-index=0.9867 for RRT. Regarding the RSF model, C-index=0.6650 was reached for CKD stage progression; decreased eGFR C-index=0.6759; RRT C-index=0.8926. DNN models applied in survival analysis context with considerations of longitudinal covariates at the start of follow-up can predict renal stage progression, a significant decrease in eGFR and RRT. The success of these survival models lies in the appropriate definition of survival times and the analysis of covariates, especially those that vary over time.

**Keywords :** artificial intelligence, chronic kidney disease, deep neural networks, survival analysis
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