



Shaping Tomorrow's Nephrology: Insight-Driven Kidney Care

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A Novel Prediction Model for Kidney Failure in Korean Patients with Chronic Kidney Disease

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Objectives : Although international risk prediction models for kidney failure (KF) in patients with chronic kidney disease (CKD) are well-established, there has been a consistent need to develop a KF risk prediction model customized for the Korean population.

Methods : We analyzed data from the KoreaN Cohort Study for Outcomes in Patients With Chronic Kidney Disease (KNOW-CKD). We excluded patients with a baseline eGFR <15 ml/min/1.73m², polycystic kidney disease, or missing core variables. The primary outcome was KF, defined as dialysis initiation or kidney transplantation. To evaluate the cumulative area under the curve (AUC), variables were added sequentially from highest to lowest univariable AUC. Upon selecting a step with a significant AUC increase, multivariable Cox regression analysis was performed to determine a prediction model where all variables showed a significant association with 5-year KF. For external validation, we applied this model to 9,053 CKD patients from Seoul National University Hospital (2002–2023).

Results : Among 2,238 Phase I and 1,404 Phase II patients in KNOW-CKD, 2,871 were analyzed. The estimated glomerular filtration rate (eGFR) had the highest univariable AUC of 0.845 (0.828–0.862), followed by log-transformed UPCR at 0.832 (0.814–0.850). Cumulative AUC analysis revealed a final significant increase in a 25-variable model. From this, a final 9-variable model (age, sex, eGFR, UPCR, blood urea nitrogen, albumin, hemoglobin, phosphorus, and pulse pressure) significantly associated with 5-year KF risk was established, achieving an AUC of 0.919 (0.908–0.931). In the external validation cohort, the model demonstrated excellent performance with an AUC of 0.911 (0.902–0.919).

Conclusions : A novel KF risk prediction model customized for Koreans, featuring a different variable combination than international models, was successfully developed. Notably, it incorporates pulse pressure—an easily measurable and highly accessible hemodynamic parameter rarely featured in international models—highlighting a unique and practical advantage for predicting CKD progression in real-world clinical settings.

Figure.jpg



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Variable	β coefficient	HR (95% CI)	P-value	C-index (95% CI)
eGFR (2009 CKD-EPI Cr), per 5	-0.383	0.68 (0.64, 0.72)	<0.001	0.919 (0.908, 0.931)
UPCR, per 1 log	0.729	2.07 (1.83, 2.34)	<0.001	
Sex, Male	0.897	2.45 (1.94, 3.10)	<0.001	
Age, per 10 yr	-0.314	0.73 (0.67, 0.80)	<0.001	
Albumin	-0.653	0.52 (0.40, 0.68)	<0.001	
Hemoglobin	-0.161	0.85 (0.79, 0.91)	<0.001	
Pulse pressure, per 10 mmHg	0.126	1.13 (1.05, 1.23)	0.002	
BUN, per 10 mg/dL	0.135	1.14 (1.04, 1.25)	0.004	
Phosphorus	0.198	1.22 (1.02, 1.46)	0.030	