

**Abstract Submission No.: A-0466****Impact of retinal photography-based deep learning system on risk stratification for chronic kidney disease progression**

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**Objectives :** We had previously developed a deep-learning-based risk evaluation system from retinal photographs, Reti-CKD, for stratifying chronic kidney development risk in kidney function preserved people. This study aims to evaluate whether Reti-CKD can improve risk assessment of kidney disease progression in diabetic patients with prevalent CKD.

**Methods :** Total of 5348 diabetic patients from two tertiary hospitals in Korea were evaluated. Patients with estimated glomerular filtration rate (eGFR) <90 ml/min/1.73m<sup>2</sup> or albuminuria were included. Those with missing data for retinal photograph, serum creatinine, or albuminuria were excluded. Patients were categorized into low-risk, moderate-risk, and high-risk groups according to the KDIGO criteria for prognosis of CKD. The KDIGO groups were additionally dichotomized based on Reti-CKD score (Reti-CKD <20 and ≥20). CKD progression was compared between the categories using Cox regression models. Primary outcome was CKD progression, defined as incremental progression to a higher NKF-KDOQI CKD stage.

**Results :** The mean age of the patients was 62.4 ± 11.4 years and 60.6% were male. Mean eGFR was 86.6 ± 15.3 mL/min per 1.73 m<sup>2</sup> and albuminuria was present in 46.9%. During a median follow-up of 5.0 (interquartile range, 2.5-7.8) years, primary outcome developed in 1379 (25.8%) patients. The primary outcome incidence rate gradually increased with higher KDIGO and Reti-CKD combined risk categories. The risk for CKD progression progressively increased in KDIGO moderate-risk and high-risk groups compared to low-risk. When Reti-CKD was incorporated to the KDIGO category, significant stratification of CKD progression risk was noted in the KDIGO low-risk and moderate-risk groups (Table 1 and figure 1). Additionally, the combination of KDIGO and Reti-CKD classification showed better discrimination power compared to the KDIGO only classification (delta c-statistics, 0.03; 95% CI 0.02 to 0.040).

**Conclusions :** Retinal photography-based deep learning system (Reti-CKD) further stratifies the risk of CKD progression and improves predictability in diabetic patients with reduced renal function.

Table.jpg

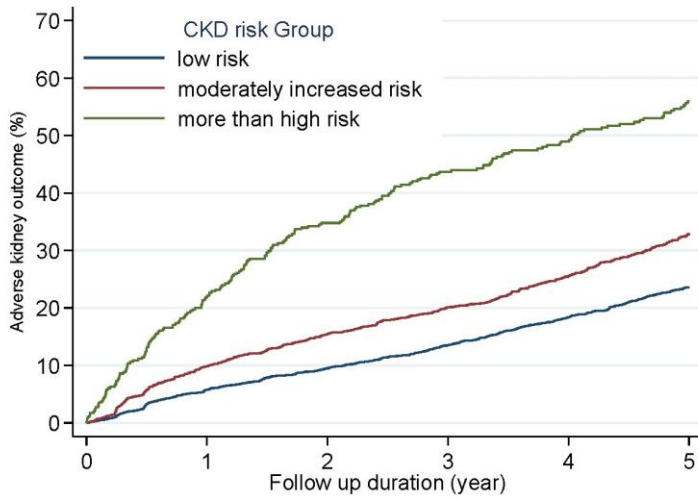
**Table:** Cox hazard ratios for chronic kidney disease progression according to KDIGO strata and Reti-CKD

	<b>Crude model</b>	<b>Adjusted model</b>
	<b>HR (95%CI)</b>	<b>HR (95%CI)</b>
<b>KDIGO risk strata only</b>		
Low risk	Ref	Ref
Moderately increased risk	1.50 (1.33-1.68)	1.65 (1.47-1.86)
≥ High risk	3.31 (2.83-3.88)	3.29 (2.79-3.86)
<b>KDIGO risk strata + Reti-CKD</b>		
Low risk & Reti-CKD <20	Ref	Ref
Low risk & Reti-CKD ≥20	1.82 (1.54-2.16)	1.43 (1.20-1.71)
Moderately increased risk & Reti-CKD <20	1.45 (1.26-1.66)	1.59 (1.38-1.84)
Moderately increased risk & Reti-CKD ≥20	2.75 (2.31-3.27)	2.36 (1.98-2.83)
≥ High risk	3.80 (3.23-4.48)	3.59 (3.03-4.26)

Primary outcome was defined as incremental progression to a higher NKF-KDOQI CKD stage.

Table.jpg

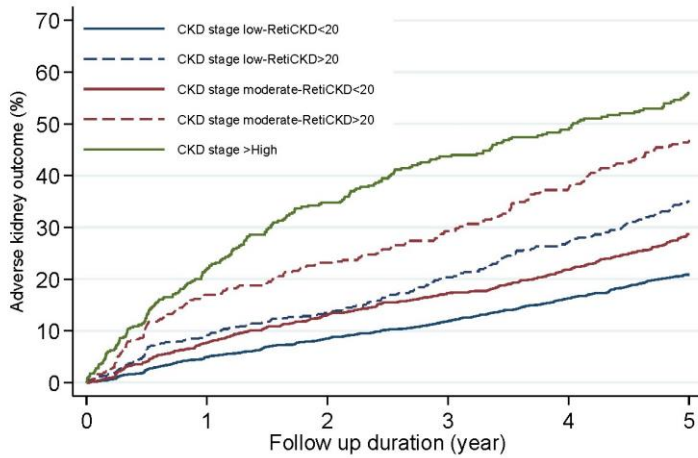
(A)



Number at risk

	0	1	2	3	4	5
G1	3135	2825	2586	2341	2015	1663
G2	1814	1545	1379	1255	1086	888
G3	399	293	239	199	169	133

(B)



Number at risk

	0	1	2	3	4	5
G1	2525	2298	2113	1929	1671	1397
G2	610	527	473	412	344	266
G3	1393	1215	1084	996	875	725
G4	421	330	295	259	211	163
G5	399	293	239	199	169	133