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Novel Non-invasive Chronic Kidney Disease Risk Stratification Tool Derived from Retina-based Deep learning and Clinical Factors for People with Preserved Kidney Function

Jung Tak Park
Severance Hospital, Korea, Republic of

Chronic kidney disease (CKD) is a major global public health concern. Early screening of individuals at risk of CKD development is essential. Currently, screening primarily relies on assessing creatinine-based estimated glomerular filtration ratio (eGFR) and urinalysis. However, these methods are suboptimal in the early identification of at-risk individuals for CKD, as serology and proteinuria have low predictive performance in those with preserved kidney function. Moreover, these biomarkers exhibit high interpersonal variability and require significant medical resources to obtain test results. We have developed a novel CKD risk-scoring system that uses a deep-learning algorithm to detect CKD via retinal imaging (i.e., Reti-CKD score) to help healthcare professionals identify individuals with preserved kidney function who are at risk of CKD. We confirmed a dose-dependent association between the Reti-CKD score and CKD incidence in two longitudinal studies, the UK Biobank and Korean Diabetic Cohort. Moreover, Reti-CKD scores showed superior performance compared to the current standard of care, the eGFR, in both the UK Biobank and Korean Diabetic Cohort.
The Reti-CKD score is the first validated imaging-based CKD risk-scoring system that targets individuals with preserved kidney function. This novel CKD risk scoring system has the potential to be integrated into retinal cameras and can help the community and primary care clinics in the primary prevention of CKD, which traditionally relies on serum creatinine and proteinuria.