Noninvasive, smart-CKD diagnostic device for management of chronic kidney disease

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Chronic kidney disease (CKD) affects 10% of the global population, among which renal fibrosis is a progressive process that can lead to end-stage renal failure. Early diagnosis and active monitoring are particularly

important.

Researchers from the Department of Health Technology and Informatics of The Hong Kong Polytechnic University (PolyU) have developed Smart-CKD (S-CKD), a non-invasive computer-aided diagnostic tool. It integrates ultrasound data and selected clinical variables to provide clinical insights and assesses the risk of moderate-to-severe renal fibrosis progression in CKD patients with a promising diagnostic efficiency of 80%.

The research findings have been published in the journal *Academic Radiology*.

Early diagnosis and accurate staging of renal fibrosis significantly guide treatment strategies and prognostic assessment, enabling timely preventive measures to avoid or delay disease exacerbations. However, identifying individuals at high risk of advanced renal fibrosis with precision continues to pose a challenge in clinical practice.

To tackle this challenge, a team led by Prof. Michael Tin Cheung Ying, Associate Head; and Dr. Ziman Chen, Postdoctoral Fellow of the Department of Health Technology and Informatics at PolyU have collaborated with Dr. Zhongzhen Su, Vice President of The Fifth Affiliated Hospital of Sun Yat-sen University to invent S-CKD which aims to improve disease progress monitoring and clinical management of CKD using informatic technology. This device offers a cost-effective solution for guiding patient management, thereby contributing notable clinical advantages.

Prof. Ying said, "While renal biopsy remains the gold standard for diagnosing and staging renal fibrosis, its invasive nature imposes limitations on conducting multiple observations and follow-ups, and has potential complications. Therefore, there is a pressing need to develop a

non-invasive biomarker for precise monitoring and clinical management of renal fibrosis and its progression."

By leveraging machine learning, S-CKD integrates three pivotal clinical parameters—age, ultrasonic renal length and end-diastolic flow velocity of the interlobar renal artery, to assist medical practitioners in assessing renal fibrosis risk in CKD patients during routine clinical practices. It plays a crucial role in guiding treatment decisions and improving patient prognosis. S-CKD is accessible through an online web-based platform or in offline document-based format, making it a user-friendly auxiliary instrument for flexible clinical applications.

Prof. Ying said, "We plan to conduct further prospective clinical research on S-CKD, utilizing PolyU's innovative medical technology and facilities in collaboration with medical institutions in the Greater Bay Area and our Hong Kong partners. Together, we will collaborate on research to enhance the impact of S-CKD on clinical management, ultimately improving CKD patients' prognosis."

Prof. Ying hopes that World Kidney Day on 14 March will raise public awareness about kidney disease and promote the importance of early prevention of chronic diseases. The research team will continue to make contributions to advancing health care development in Hong Kong and the world with their innovative technology.