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The optimal equation of estimated glomerular filtration rates for pediatric chronic kidney disease patients in transition from adolescent to adult: results from KNOW-PedCKD

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Objectives: Estimated glomerular filtration rate (eGFR) is an important value in kidney function evaluation, and it is useful to identify chronic kidney disease (CKD) and its progression. Clinicians use various equations to calculate eGFR which is based on serum creatinine (Cr) or cystatin C (CysC) concentration with other variables. However, there is a lack of consensus on which equation is proper in transition from adolescent to adult. Therefore, we evaluated the reliability of various eGFR calculation methods compared to measured isotope GFR (iGFR).

Methods: Seventy-three patients aged from 15 to 23 years were included in the KoreaN cohort study for Outcome in patients With Pediatric Chronic Kidney Disease (KNOW-PedCKD). We compared measured iGFRs with various eGFR calculation equations; the bedside serum Cr based equation (Schwartz_{Cr}), the CysC based equation (Schwartz_{CysC}), combined Cr and CysC-based Chronic Kidney Disease in Children equation (CKiD_{Cr-CysC}), the Cr-only CKD-EPI (CKD-EPI_{Cr}), and combined Cr and CysC CKD-EPI equation (CKD-EPI_{Cr-CysC}).

Results: Fifty-two (71.2%) patients were male and 86.3% of patients had non-glomerular causes of CKD. A total of 136 measurements of iGFR was performed at the median age of 17.0 (interquartile range (IQR) 16.0–18.8) years. The mean iGFR was 42.2 ± 29.0 mL/min/1.73m². The Schwartz_{Cr} equation had lowest bias (-0.6 mL/min/1.73m²), high correlation (0.96), and highest accuracy (81.6% within 30% of iGFR) while Schwartz_{CysC}, CKiD_{Cr-CysC}, CKD-EPI_{Cr}, and CKD-EPI_{Cr-CysC} had an overestimation bias (+1.4, +2.1, +15.5 and +8.9 mL/min/1.73m², respectively). In adolescents (n=93) from 15 to 18-year-old, the bias of Schwartz_{Cr} equation was lowest (+0.3 mL/min/1.73m²) and its accuracy was highest (81.7% within 30% of iGFR). In young adults (n=43) older than 18-year-old, the bias of the CKiD_{Cr-CysC} equation was lowest (+1.3 mL/min/1.73m²) and the accuracy of Schwartz_{Cr} was highest (81.4% within 30% of iGFR).

Conclusions: The Schwartz_{Cr} equation may be an optimal method to calculate eGFR in young adults with CKD.