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Renal function assessment in older people: comparative analysis of estimation equation with serum creatinine

Stefania Peruzzo [1 2], Silvia Ottaviani [1 2], Luca Tagliafico [1 2], Mariya Muzyka [1 2], Marta Ponzano [3], Cristina Marelli [3], Alessio Signori [3], Alessio Nencioni [1 2], Fiammetta Monacelli [1 2]

Affiliations

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Abstract

Introduction: Age-related changes occurring in the kidney can lead to a reduction in Glomerular Filtration Rate (GFR); especially in older adults with multimorbidity and/or frailty, an accurate evaluation of kidney function is critical. For the estimation of GFR in patients over 70 years, CKD-EPI (Chronic Kidney Disease Epidemiology Collaboration) is often used. However, validated equations exist for old-age populations like BIS1 (Berlin Initiative Study 1) and FAS (Full Age Spectrum). Here we aimed to compare the performance of CKD-EPI, MDRD (Modification of Diet in Renal Disease), BIS1, and FAS in assessing eGFR in a population of patients over 70, to evaluate which equations show the most accurate performance in our setting.

Materials and methods: A total of 499 older adults were consecutively recruited in the Orthogeriatric ward and Oncogeriatrics clinic of IRCCS Polyclinic San Martino in Genoa Italy. eGFR was calculated using CKD-EPI, MDRD, BIS1, and FAS, calculating mean, median, standard deviation, and interquartile range. Bland-Altman graphs were used to evaluate how each equation performs with respect to the others and the concordance of the attribution of the KDIGO CKD stage was performed with Cohen's K constant and chi-squared test.

Results: Patients' mean age was 82.6 years (± 7.44), and the mean creatinine value was 0.97 (± 0.71) mg/dl. The mean value of eGFR was 70 mL/min with CKD-EPI (± 20.6) and MDRD (± 25.7), 57 mL/min with BIS1 (± 16.7) and FAS (± 19.0), respectively. BIS1 and FAS estimated lower eGFR values than CKD-EPI and MDRD. As age increases, a steady decrease in filtrate value is observed with BIS1 and FAS. MDRD and CDK-EPI do not show the same trend. The performance of the equations at a fixed eGFR value of 30 mL/min is more linear for BIS1 and FAS compared with CKD-EPI and MDRD. Upon evaluation with chi-square, the attribution of KDIGO stage was statistically different among the various equations.

Discussion: An appropriate assessment of renal function is of key clinical relevance to prevent adverse outcomes and risk of drug accumulation in older adults. Our study originally showed that in persons aged more than 70 years old BIS1 is the most accurate formula in calculating eGFR values when only serum creatinine is available.

Keywords: BIS1; CKD-EPI; FAS; MDRD; chronic kidney disease; creatinine; eGFR equations; older adults.

Figures

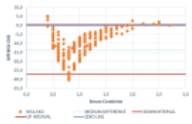

Figure 1 Bland Altman graph plotting the...

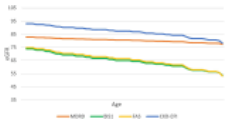

Figure 2 Trend of the performance of...

Figure 3 Trend of the performance of...