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Differences in GFR Estimation Based on Creatinine and Cystatin C in a Cohort of Older Medical Patients, Age-Matched Controls, and Healthy Young Adults

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CONCLUSION

Approximately one-third of older medical patients had a difference of ≥15% between $eGFR_{crea}$ and $eGFR_{comb}$, and that proportion was significantly higher compared to older and younger controls. These results suggest that older patients may gain the most significant performance-related benefit from implementing cystatin C.

BACKGROUND & AIMS

Accurate assessment of glomerular filtration rate (GFR) is essential for diagnosing kidney disease and **determining the appropriate dosing of medications eliminated via the kidneys.** In clinical practice, serum creatinine is the standard biomarker used to estimate kidney function, but non-GFR factors, such as age, muscle mass, and nutritional status, can compromise its accuracy. The combination of creatinine and cystatin C has been shown to enhance the performance of GFR estimates across diverse patient populations. However, given the additional costs associated with cystatin C measurement, it is crucial to determine which patients would benefit most from its use.

This study compares the clinically significant differences between creatinine- and cystatin C-based equations in older patients, age-matched healthy older adults, and younger individuals.

METHODS

Data from older medical patients (30-day follow-up), older healthy participants matched by age and sex to the older patients, and younger healthy participants were adapted from the FAM-CPH study. Exclusion criteria included cognitive cooperation difficulties, terminal illness, autoimmune diseases, a current cancer diagnosis, and the use of immunosuppressive or anti-inflammatory medication. GFR was estimated using CKD-EPI equations based on the 2009 creatinine ($eGFR_{crea}$), 2012 cystatin C ($eGFR_{cysc}$), and the 2012 combination of creatinine and cystatin C ($eGFR_{comb}$).

The primary outcome was a comparison of the proportion of participants with a **≥15% difference between $eGFR_{crea}$ and $eGFR_{comb}$.**

RESULTS

Table 1. Patient characteristics.

	Patients (n = 52)	Older controls (n = 52)	Younger controls (n = 59)
Sex (female)	25 (48%)	25 (48%)	26 (49)
Age (yr)	75 (71-82)	75 (71-82)	26 (24-29)
Weight (kg)	77 (66-87)	75 (65-84)	71 (65-79)
Body mass index (kg/m2)	26 (22- 32)	26. (23-28)	23 (22-24)
Smoking	6 (12 %)	NA	NA
Health Related Quality of Life (EQ-5D-5L)	0.79 (0.74-0.86)	0.86 (0.82: 1)	NA
Mini-Nutritional Assessment score	12 (9-13)	14 (12-14)	NA
Mini-Mental State Examination Score	29 (26-30)	29 (27-30)	NA
Handgrip strength (kg)	25 (19-37)	32 (22-40)	40 (34-50)
Gait speed (m/s)	0.8 (0.6-1.0)	1.3 (1.1:1.3)	1.4(1.3-1.5)
Creatinine (mg/dL)	0.96 (0.83-1.21)	0.90 (0.81-1.0)	0.84 (0.76-0.94)
Cystatin C (mg/L)	1.2(1.1-1.6)	1.1 (0.9-1.2)	0.8 (0.8-0.9)
CRP (mg/L)	3 (1-9)	1(1-2)	0(0-1)
IL6 (pg/mL)	0.8 (0.6: 1.6)	0.6 (0.3- 0.9)	0.3 (0.3-0.3)
GDF15 (pg/mL)	1562 (1050-2178)	1004 (830-1294)	288 (241-311)
suPAR (ng/mL)	3.3 (2.6:4.6)	2.6 (2.2:3.1)	2.0 (1.8:2.5)
$eGFR_{crea}$ (mL/min/1.73m^2)	65.4 (50.0-79.7)	71.9 (60.3-80.4)	109.2 (100.5-118.9)
$eGFR_{cys}$ (mL/min/1.73m^2)	53.8 (41.0-63.7)	66.73768 (56.9-78.8)	111.0 (102.6- 119.0)
$eGFR_{comb}$ (mL/min/1.73m^2)	60.4 (42.5-71.2)	71.3 (60.1-80.1)	110.1 (101.2-118.6)
Difference $eGFR_{cys}$-$eGFR_{crea}$ (mL/min/1.73m^2)	-8.1 (-18.0 - -2.7)	-4.0 (-9.6 - 2.5)	2.2 (-3.5 - 6.4)
Difference $eGFR_{comb}$-$eGFR_{crea}$ (mL/min/1.73m^2)	-3.3 (-9.78 - -0.8)	-0.4 (-3.7 - 3.5)	1.5 (-1.4 : 3.6)

Of the 128 older patients in the FAM-CPH cohort, 54 were eligible for this study. Fifty-two of the 54 participants (48% female; median age 75 years) were matched with older healthy participants, while the younger control group comprised 59 participants (49% female; median age 26 years). Older individuals had significantly lower eGFR values across all equations than younger controls. **Overall, 36% of older patients had an $eGFR_{comb}$ that differed by more than 15% from $eGFR_{crea}$.** This discrepancy was observed in 8% of older controls and 4% of younger controls (p ≤ 0.0004).

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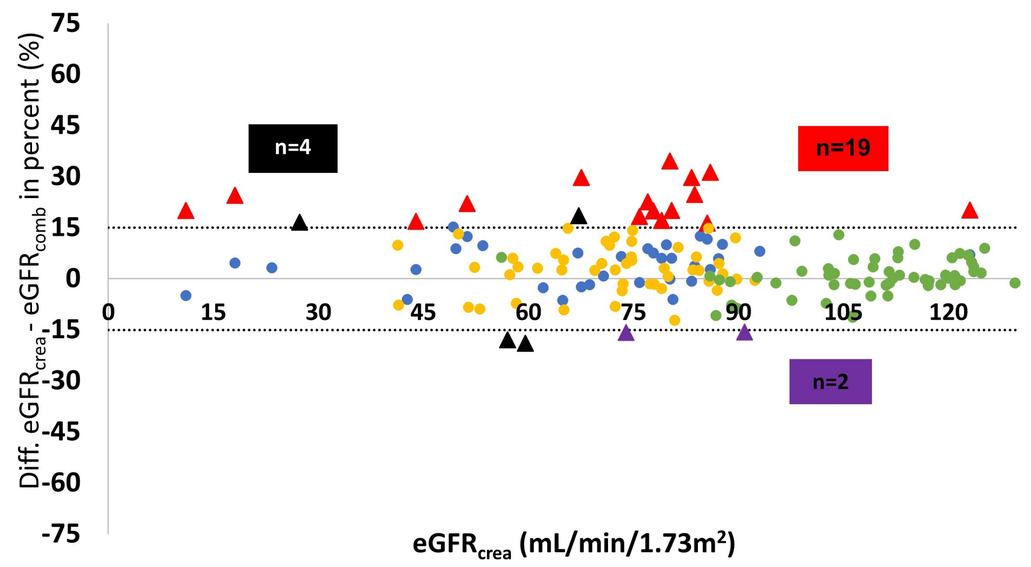

Figure 1: Circles between ±15% indicate that the GFR estimates are within an acceptable range. The blue circle represents the patient group, the yellow represents older controls, and the green represents younger controls. Triangles indicate a clinically significant difference of > ± 15%. Red triangles represent the patient group, black triangles represent older controls, and purple triangles represent younger controls.