COMPARISON OF CREATININE-BASED EQUATIONS FOR ESTIMATION OF RENAL FUNCTION IN CHRONIC HEART FAILURE PATIENTS

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Purpose

The renal dysfunction is common and related with the poor prognosis in the chronic heart failure (CHF). The glomerular filtration rate (GFR) has a paramount diagnostic role in the chronic kidney disease (CKD). Cystatin C improves estimation of GFR over creatinine alone; however, the association between most of the risk factors and GFR is more accurate by GFR based on creatinine alone. The most widely used creatinine-based GFR formulas are the Cockcroft-Gault (CG), Modification of Diet in Renal Disease Study (MDRD) and Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equations. The MDRD equation limitations are imprecision and systematic underestimation of measured GFR at higher levels. The CKD-EPI formula is more accurate than others in numerous populations, but it has not been studied well in CHF. Our aim was to compare nine different equations for estimation of renal function in CHF patients.

Patients & Methods

<u>154</u> patients (86.4% males) with sistolic <u>CHF I-IV NYHA class</u> (due to postinfarction cardiosclerosis in 80.9%, dilated cardiomyopathy in 9.2%, hypertensive heart disease without CAD in 9.9%) were studied. *All patients were stable on optimal medical therapy in accord with contemporary guidelines.*

Criteria of exclusion:
* primary renal and renal vessel diseases;
* autoimmune diseases;
* oncological diseases;
* acute coronary syndrome and cardiac surgery during 6 months before study;
* valvular heart disease.

Methods:

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* Glomerular filtration rate – eGFR	CG, original 4-variable MDRD (4MDRD), 2-variable MDRD (2MDRD), simplified MDRD (sMDRD), CKD-EPI, Jellife 1 and 2, Gates, Salazar-Corcoran equations
* Urinary albumin excretion – UAE	Immunoenzimatic and immunoturbidimetry assays of urine sample and 24h urine
Cardiac function	Echocardiography: M-, B-mode, Doppler study

Patients characteristics:

Characteristics	Median (interquartile range)
Age, years	64.0 (56.0-69.0)
Serum creatinine, mcM	103.0 (87.0-120.0)
eGFR CKD-EPI, ml/min/1.73m2	65.0 (49.8-80.3)
Spot UAE, mg/ml	20.3 (6.8-38.7)
24h UAE, mg/24h	43.8 (31.6-71.0)
LV EF, % (Simpson method)	30.4 (25.3-37.1)

Between-group comparisons were performed using the Mann-Whitney U or Kruskal-Wallis test. Correlations between parameters were analyzed with Spearman's correlation test. Results are expressed as median (interquartile range).
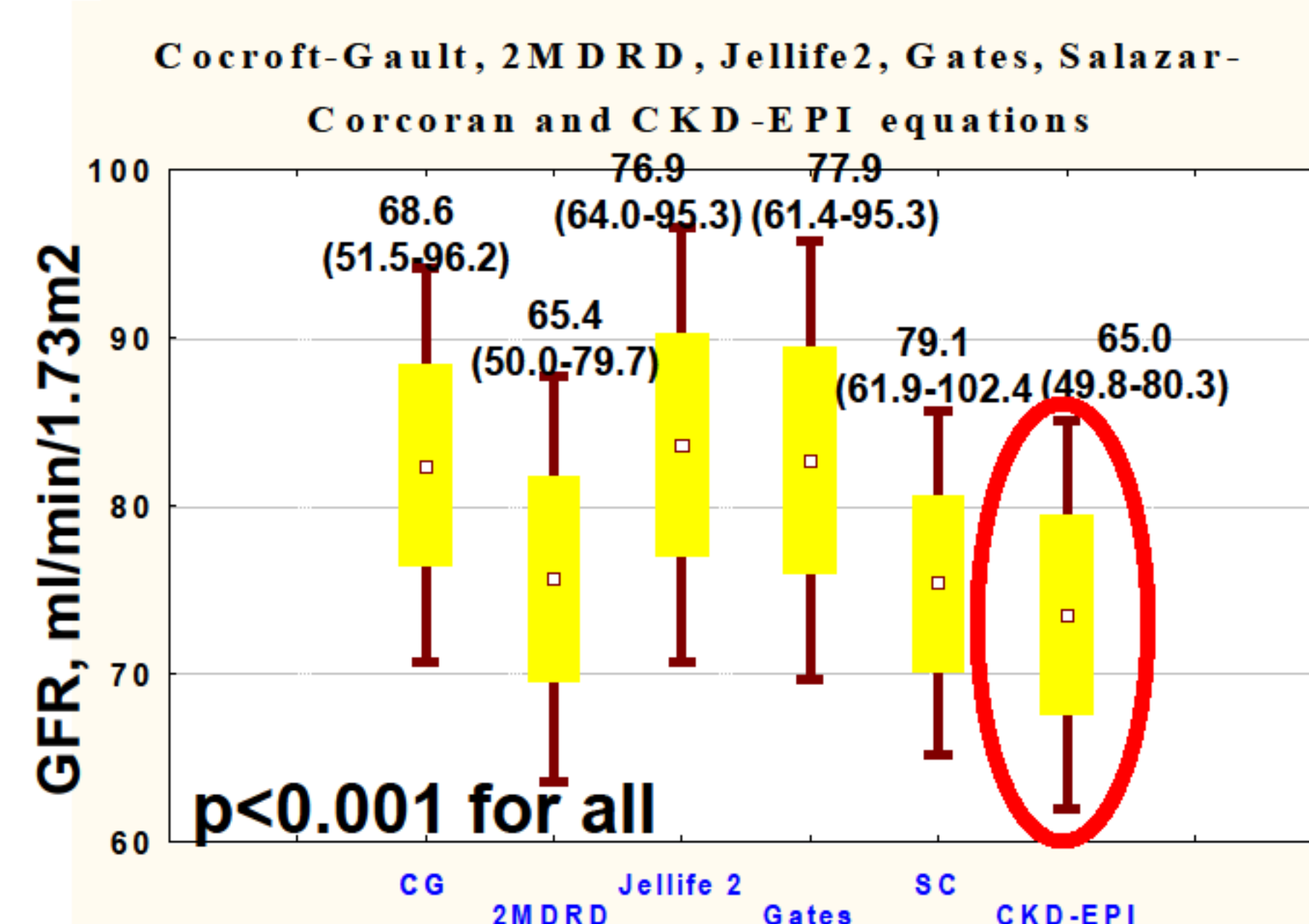
Limitations of study:
Limited number of young people, absence of racial and ethnic minorities and measured GFR in our study.
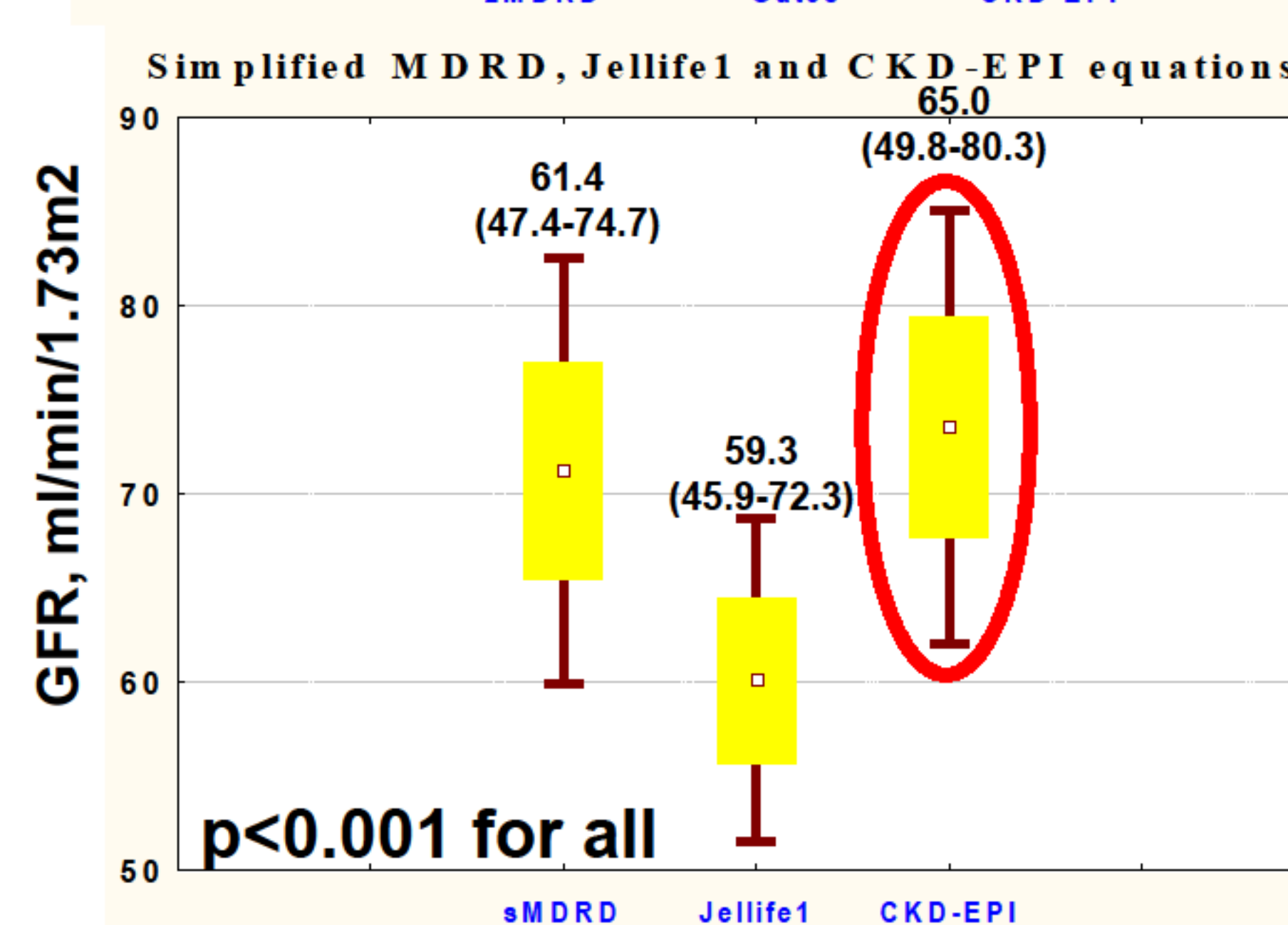
Results
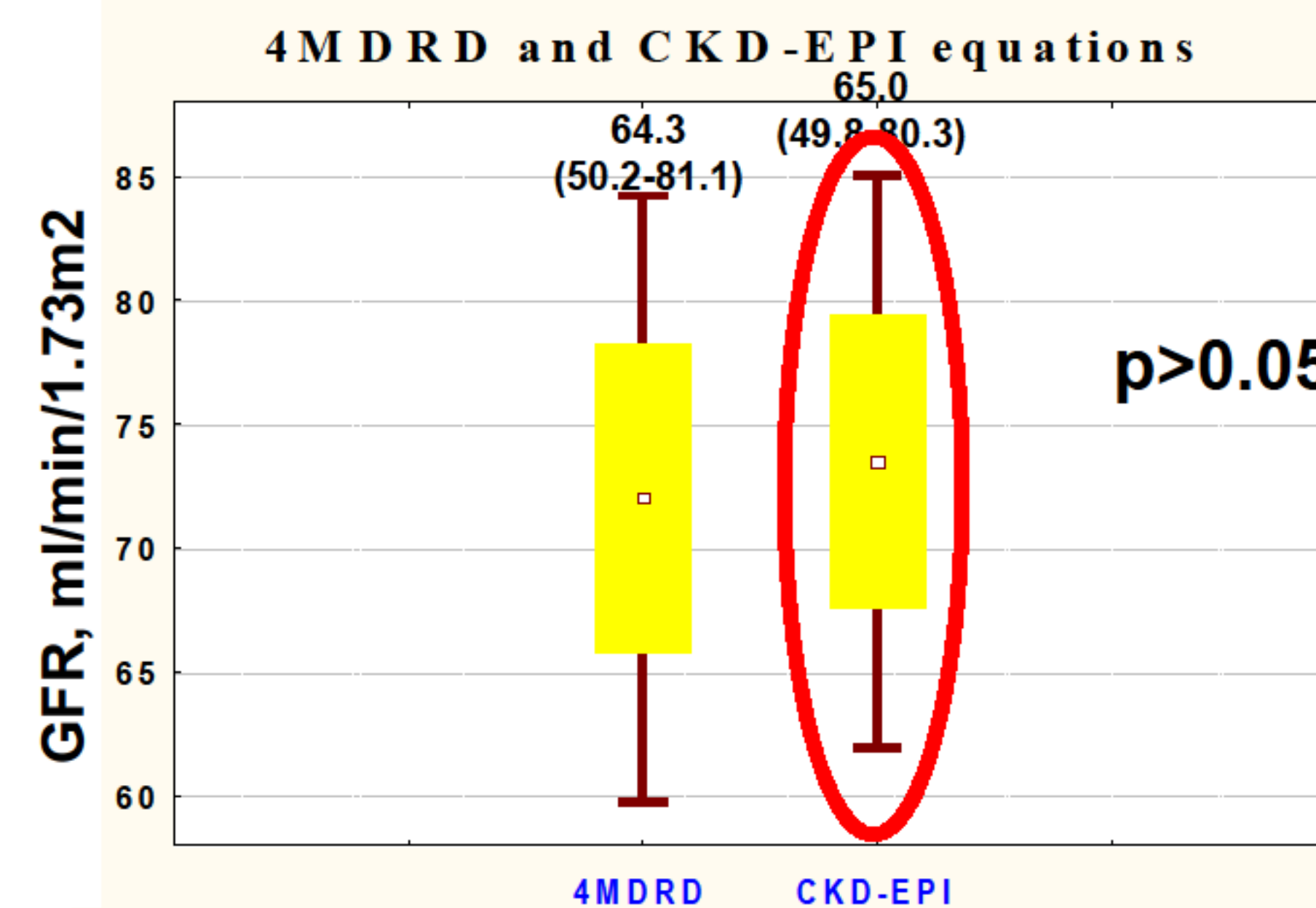
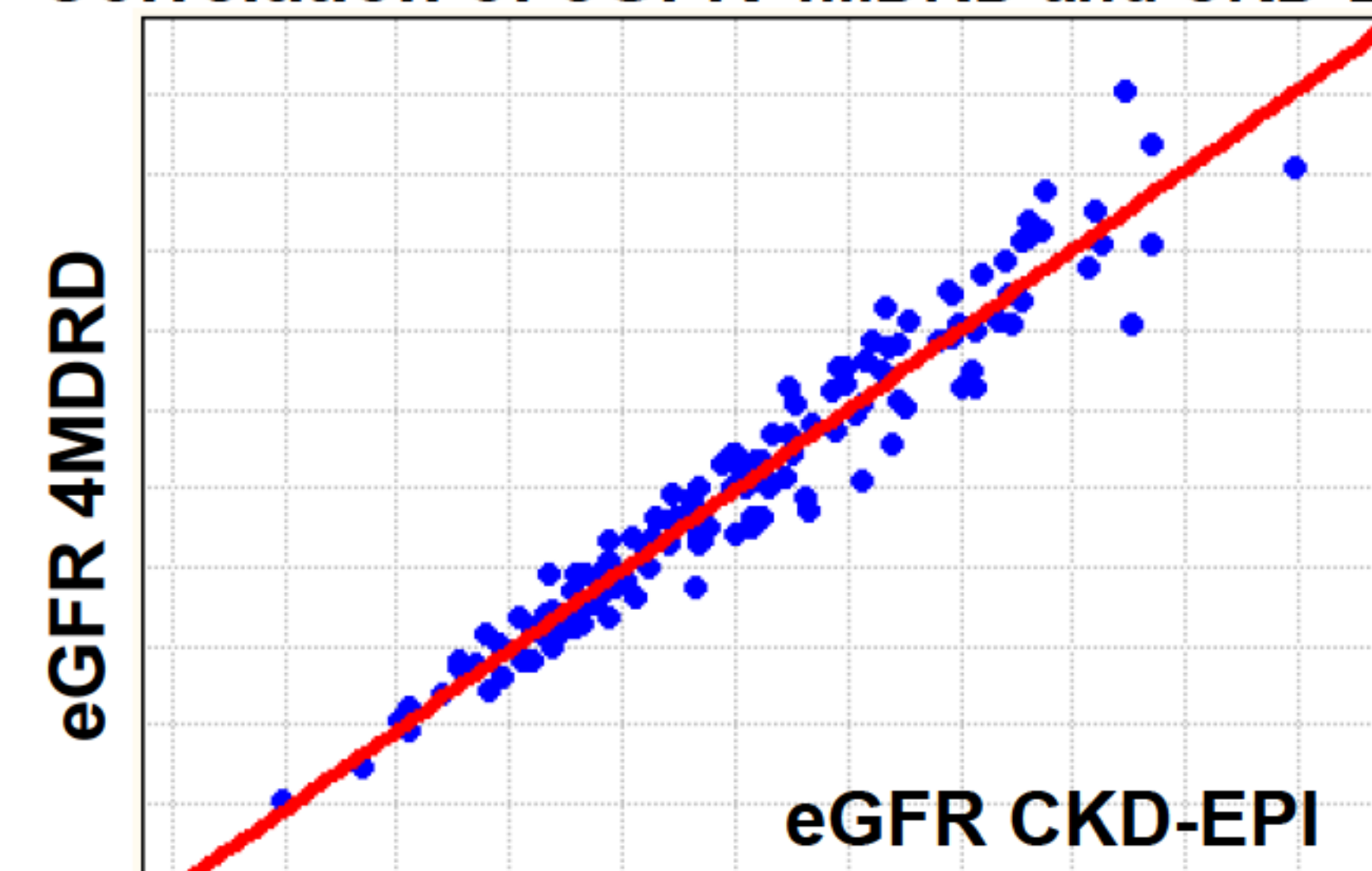eGFR CKD-EPI did not differ from eGFR 4MDRD.

eGFR CKD-EPI was lower than eGFR CG, 2MDRD, Jellife2, Gates, Salazar-Corcoran.

eGFR CKD-EPI was higher than eGFR sMDRD and Jellife 1.

Correlation of eGFR 4MDRD and CKD-EPI

eGFR CKD-EPI correlated with others eGFR: CG r=0.75, **4MDRD r=0.97, 2MDRD r=0.99**, sMDRD r=0.99, Jellife 1 r=0.97, Jellife2 r=0.96, Gates r=0.96, Salazar-Corcoran r=0.93 (p<0.001 for all), spotUAE r=-0.24 (p=0.025), 24hUAE r=-0.27 (p=0.018).

Stage CKD	CKD-EPI	4MDRD	2MDRD	sMDRD	C-G
1	12.9	13.3	13.7	9.3	29.8
2	46.4	43.9	46.0	43.6	33.6
3	39.3	41.4	38.9	45.7	35.9
4	1.4	1.4	1.4	1.4	0.7

(% of patients)

There were not significant differences in CKD stage estimated using CKD-EPI, 4MDRD and 2MDRD equations (p>0.05). 10.7% of CHF patients were accurately reclassified into higher CKD classes with CKD-EPI in comparison with sMDRD, p<0.001. 32.7% of CHF patients were reclassified into lower and 9.9% into higher CKD classes with CKD-EPI in comparison with CG equation, p<0.001.

Conclusion

The CKD-EPI equation and original 4-variable MDRD may be the preferred creatinine-based GFR estimation method in chronic heart failure patients, particularly those with mild and moderate renal dysfunction.