Estimated GFR by Serum Myo-inositol, Valine, Creatinine and Cystatin-C Outperforms Current CKD-epi Equation in Renal Transplant Patients

Jeffrey Meeusen[1], Frank Stämmler[2], John Lieske[3], Marcello Grassi[2], Maulik Shah[4], and Eric Schiffer[2]

[1]Mayo Clinic Department of Laboratory Medicine and Pathology (Rochester, MN), [2]Department of Research and Development, numares AG (Regensburg, Germany), [3]Mayo Clinic Division of Nephrology and Hypertension (Rochester, MN), [4]Clinical Research, Numares (Boston, MA)

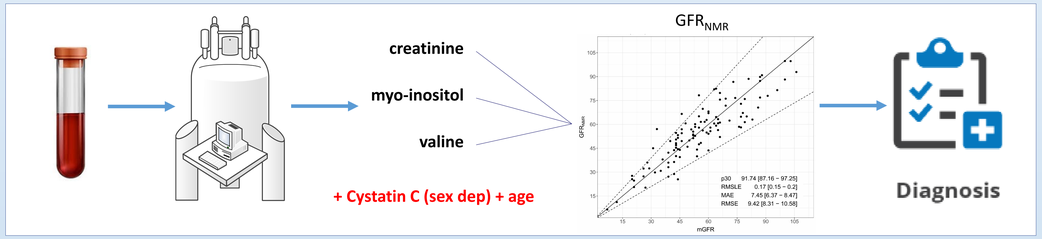
BACKGROUND

GFR Estimation is NOT reliable in Renal Transplant Recipients

- Renal Plasma Clearance using radiotracers are often required
- Established predictive formulas UNDERESTIMATE true GFR
- eGFR formulas are not accurate in low-range post-transplant kidney patients
- eGFR formula variability does not have the accuracy for year-to-year decline

GFR_{NMR} / METHODS

We have developed a novel GFR equation, GFR_{NMR}, which utilizes serum myo-inositol, valine and creatinine quantified by nuclear magnetic resonance spectroscopy (NMR) in combination with Cystatin-C, age and sex. This equation outperforms many GFR estimation methods in chronic kidney disease.



METHODS

We compared GFR_{NMR} and common eGFR equations to radiotracer gold-standard GFR measurement (mGFR) after renal transplant.

CONTACT DETAILS

maulik.shah@numares.com

Follow numares: @numares AG @numares AG @Agnumares numares NMR diagnostics

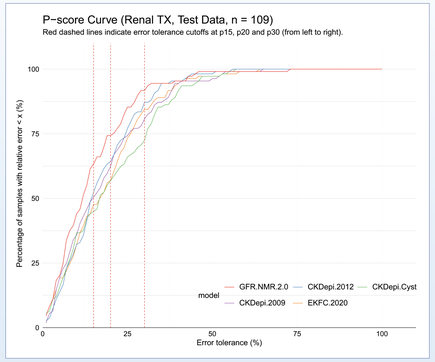
RESULTS

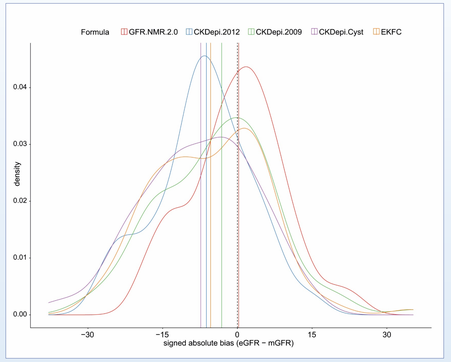
Comparison of GFR estimating formulas

- CKD-EPIcys was the least accurate
- CKD-EPIcr-cys had a P30 of 0.87
- CKD-EPIcr-cys underestimates renal reserve
- GFR_{NMR} had a P30 of 0.92
- GFR_{NMR} showed minimal bias in individuals with GFR < 60

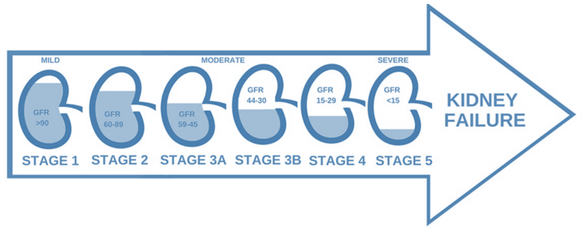
GFR_{NMR} has virtually no bias compared to other eGFR formulas

GFR_{NMR} has a MAE below the threshold needed to ascertain GFR changes over time in renal transplant patients





	meanGFR (SD)	MAE [95% CI]	P30 [95% CI]	RMSE [95% CI]
mGFR	55.83 (20.28)	Ref	Ref	Ref
eGFR NMR	55.74 (19.12)	7.45 [6.37 - 8.47]	91.74 [87.16 - 97.25]	9.42 [8.31 - 10.58]
eGFR CR	51.75 (19.83)	9.53 [8.11 - 10.93]	80.73 [74.31 - 88.07]	12.23 [10.65 - 13.93]
eGFR CyC	48.14 (20.98)	10.74 [9.26 - 12.26]	72.48 [64.22 - 80.73]	13.61 [12.01 - 15.39]
eGFR Cr CyC	48.99 (19.87)	9.41 [8.09 - 10.75]	87.16 [80.73 - 93.55]	11.78 [10.39 - 13.32]



Kidney function over time

mean ± SEM of the change in GFR after kidney transplantation in 40,963 US transplant recipients*:

−1.66 ± 6.51 ml/min/1.73 m² per year

*John S. Gill et al., JASN June 2003, 14 (6) 1636-1642; DOI: https://doi.org/10.1097/01.ASN.0000070621.06264.86

|MAE| threshold: <8.17, n=109

Equation	MAE	P30
GFR_{NMR}	***7.45***	91.74
CKD-EPI 2012	9.41	87.16
CKD-EPI 2009	9.53	80.73
CKD-EPI Cys C	10.74	72.48

CONCLUSIONS

In patients on the lower end of GFR, CKD-EPIcr-cys still lacks the accuracy necessary for clinical decision-making. GFR_{NMR}, with a P30 >0.90, may represent a non-invasive alternative to expensive radiotracer based GFR measurement in renal transplant recipients.