

A comparison of comorbidity in CKD patients based on MDRD vs. CKD-EPI equations

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Introduction

- Estimation of glomerular filtration rate (GFR) is commonly done using the MDRD equation, first published in 1999.
Levey AS, Bosch JP, Lewis JB, Greene T, Rogers N, Roth D: A more accurate method to estimate glomerular filtration rate from serum creatinine: A new prediction equation. Ann Intern Med 130:461-470,1999.
- Inaccuracies using this equation, particularly in patients with mild CKD, led to the search for better equations such as the CKD-EPI equation published in 2009.
Levey AS, Stevens LA, Schmid CH, et al. A new equation to estimate glomerular filtration rate. Ann Intern Med. 2009;150(9):604-612.
- Estimation using this equation, developed on patients across wide ranges of GFR, better estimates actual GFR in patients with GFR > 60 mL/min/1.73 m².
- We investigated the burden of comorbidity across CKD stage, comparing the two GFR equations.

Methods

- Using 13 Ingenix data on individuals with coverage in 2008 and with at least 1 serum creatinine, we computed eGFR using both equations and compared comorbidity burdens across CKD stages, particularly for patients classified differentially.
- For patients with >1 creatinine, the average was computed.
- Since ACR data was mostly unavailable, we compared the following categories/CKD stages: ≥90, 60-90 (mL/min/1.73 m²), stage 3, 4 or 5.
- Comorbidities were identified from inpatient and outpatient claims, and included atherosclerotic heart disease (ASHD), anemia, CHF, cancer, diabetes (DM), COPD, and hypertension (HTN).

Results

- The cohort was 56% female, and the age distribution was 3% <18, 27% 19-40, 42% 41-55, and 28% 56 or older.
- We identified 786,348 persons with continuous insurance coverage and at least 1 serum creatinine during 2008.
- 49.7%, 45.4%, and 4.6% were identified as ≥ 90, 60-90, and stage 3, respectively, by CKD-EPI.
- 28.3%, 63.2%, and 8.1% were similarly classified by MDRD.
- The table shows the comorbidity burden for those classified the same by both equations compared to those differentially classified by the 2 equations.
- For patients classified as having a lower eGFR by MDRD than CKD-EPI (lower half of table), the comorbidity burden was generally similar to the comorbidity burden of the higher eGFR group (top half of table).
- The figures compare comorbidity burden across eGFR, comparing MDRD to CKD-EPI; primary differences are found with stage 3; individuals identified as stage 3 with CKD-EPI generally have more comorbidity than those identified as stage 3 by MDRD.

Table 1
Comorbidity burden comparing MDRD vs. CKD-EPI

MDRD & CKD-EPI Agree		Comorbidity Burden of Patients Classified the Same by Both Equations				
		ASHD	Anemia	CHF	Cancer	DM
>= 90	>= 90	2.7%	5.5%	0.7%	3.2%	12.3%
60-90	60-90	5.7%	4.6%	1.3%	4.8%	13.1%
Stage 3	Stage 3	13.4%	11.6%	5.7%	8.5%	28.9%
Stage 4	Stage 4	21.4%	48.5%	17.9%	9.3%	49.9%

MDRD & CKD-EPI Disagree		Comorbidity Burden of Patients Classified with Higher eGFR by CKD-EPI				
MDRD	CKD-EPI	ASHD	Anemia	CHF	Cancer	DM
60-90	>= 90	2.8%	4.6%	0.6%	3.2%	10.2%
Stage 3	60-90	5.5%	5.9%	1.8%	5.1%	14.6%
Stage 4	Stage 3	14.0%	36.6%	9.1%	8.3%	44.2%
Stage 5	Stage 4	4.0%	64.0%	8.0%	12.0%	56.0%

Figure 2
Anemia

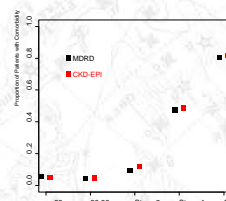


Figure 4
Cancer

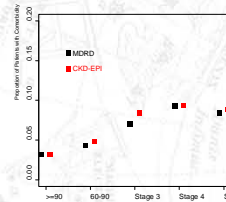


Figure 6
COPD

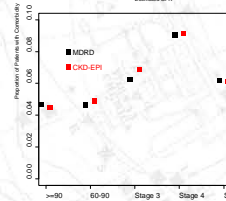


Figure 1
ASHD

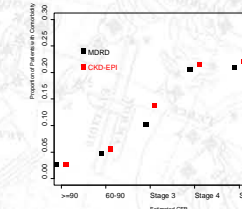


Figure 3
CHF

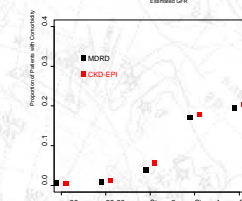


Figure 5
Diabetes

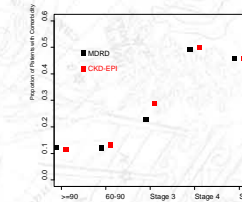
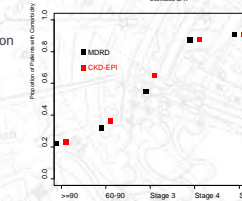


Figure 7
Hypertension



Conclusions

- These results are consistent with other studies showing more accurate estimation of actual GFR with the CKD-EPI equation for patients with less severe CKD.
- Limitations:
 - Race, which is a factor in both equations, was not available.
 - Comorbidity identified from claims.
 - Patients with serum creatinine available may be different than patients with creatinine measured.