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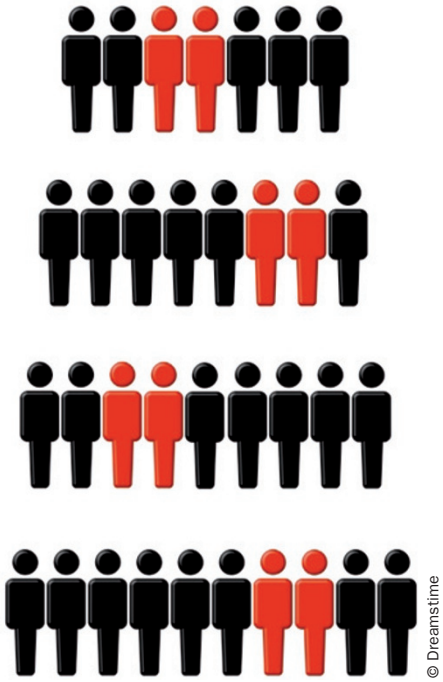
CHRONIC KIDNEY DISEASE

The CKD–EPI equation—accurately stratifying risk in CKD

Estimates of glomerular filtration rate (GFR) are central to the staging of chronic kidney disease (CKD) and for the prediction of risk associated with impaired renal function. Most laboratories estimate GFR using the Modification of Diet in Renal Disease (MDRD) Study equation—an equation first proposed in 1999. New findings from the Chronic Kidney Disease Prognosis Consortium, however, show that the more recently published Chronic Kidney Disease Epidemiology Collaboration (CKD–EPI) equation categorizes the risk of mortality and end-stage renal disease (ESRD) more accurately than does the MDRD Study equation in a broad range of populations. "Our report with data from 1 million individuals from 40 countries shows that the CKD–EPI equation classifies risk better than the MDRD Study equation across diverse groups of people in terms of age, sex, race, world religions, and clinical characteristics, with impressive consistency", says principal investigator of the Consortium, Josef Coresh. "Thus, we plan to use the CKD–EPI equation for GFR estimation in both clinical applications and research studies and we think many others will as well".

The CKD–EPI equation, which was first derived in 2009, uses the same four variables as the MDRD Study equation to estimate kidney function, but has been shown by several studies to be superior to the MDRD Study equation for predicting risk of adverse events associated with reduced renal function. As Andrew Levey, the senior author of the Consortium study explains, "the published studies were predominantly based on data from white individuals with preserved kidney function, leaving uncertainties about the ability to generalize these findings to other groups of individuals in terms of race, ethnicity and clinical characteristics".

To compare the associations of GFR estimates using the CKD–EPI equation and MDRD Study equation with outcomes in a broad population, the researchers performed a meta-analysis of data from



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1.1 million adults from 45 cohorts (25 general population cohorts, 7 cohorts at high risk of cardiovascular or kidney disease, and 13 CKD cohorts). "Given that GFR category is a central measure for CKD definition and staging, our comparison was focused on GFR estimates broken into six categories, corresponding to various stages of kidney disease", explains lead author, Kunihiro Matsushita. The researchers assessed the proportion of individuals who were reclassified using the CKD–EPI equation rather than the MDRD Study equation and investigated whether reclassification was concordant with future risk of adverse outcomes. "This methodology directly shows whether physicians' use of GFR categories in assessing risk will be improved by switching equations," says Matsushita.

The researchers found that the newer CKD–EPI equation consistently classified future risk better than the older MDRD Study equation. Compared with the MDRD Study equation, use of the CKD–EPI equation reclassified 24.4% and 0.6% of individuals in the general population cohorts to higher and lower GFR categories, respectively. The researchers observed similar reclassification among individuals from the high-risk cohorts (15.4% upwards and 1.2% downwards), but less upward and more downward reclassification among individuals from the CKD cohorts (6.6% and 3.2%, respectively). Approximately one-third of participants with mild to moderate kidney disease (estimated GFR 30–89 ml/min/1.73 m^2) as classified using the MDRD Study equation were found to have a higher estimated GFR when the CKD–EPI equation was used, resulting in a lower prevalence of CKD. These individuals also had a 1.3–2.0-fold lower risk of dying or developing ESRD, even after adjustment for potential cofounders.

Subgroup analyses revealed that the CKD–EPI equation predicted clinical risk more accurately than did the MDRD Study equation in older and Asian individuals and performed at least as well for predicting risk in black individuals.

On the basis of their findings, the researchers recommend that more laboratories adopt the CKD–EPI equation to estimate kidney function. Given that the CKD–EPI equation uses the same variables as the MDRD Study equation to estimate GFR, they believe that implementation of the CKD–EPI equation would contribute to better and more targeted allocation of health care for CKD management without additional laboratory costs. "The totality of evidence now strongly favors the CKD–EPI equation for providing improvement in both validity of GFR estimation and risk prediction. As of 2011, 4% of laboratories that report GFR along with serum creatinine level had switched to the new equation ... our data should accelerate this trend", Coresh concludes.

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