November 12, 2021

To: SHC, LPCH and VC Medical Staff

From: Stanford Health Care Clinical Laboratories

Subject: Implementation of a new CKD-EPI Creatinine equation for eGFR Refit without race variable and cystatin C- and creatinine-cystatin C based eGFR equations at Stanford Medicine

Chronic kidney disease (CKD) is a significant public health problem worldwide and is associated with adverse outcomes and high medical costs. It is essential to identify patients at risk for developing CKD and slowing the progression of kidney dysfunction.

The difficulties of measuring glomerular filtration rate have led to the development of equations like the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) to estimate GFR (eGFR) for evaluating kidney function.

The CKD-EPI equation for GFR includes a race coefficient because of findings that African/Black Americans had, on average, higher serum creatinine concentrations than non-African/Black Americans. The observed differences between African/Black and non-African/Black Americans creatinine concentrations in blood were hypothesized to be due to increased muscle mass. However, there are limited studies to support this claim.

Race is a social, not biological construct that can result in health disparities and have detrimental effects on health outcomes for marginalized and minoritized communities. The inclusion of the race coefficient in the CKD-EPI equation results in higher eGFR values for African/Black Americans than non-African/Black Americans with the ***same*** serum creatinine concentrations, age, and gender. The higher eGFR in African/Black Americans may lead to delayed referral to nephrology care and kidney transplantation. Moreover, multiracial individuals may not want to be placed in a single race category, and healthcare providers may assume a patient's race based on visual appearance. On September 24, 2021, the National Kidney Foundation (NKF) and the American Society of Nephrology (ASN) Task Force released a report recommending using a new eGFR CKD-EPI creatinine equation that was refit without the African/Black race coefficient (Equation 1 below).

Cystatin C is a non-glycosylated basic protein (molecular weight: ~13.36 kDa) endogenously produced at a constant rate, freely filtered in the glomerulus, neither reabsorbed nor secreted in the renal tubule, and not extra-renally eliminated. One advantage of the cystatin C- compared to the creatinine-based eGFR equation is that it is *independent* of muscle mass, diet, and race. The Task Force also recommended using cystatin C and cystatin C with creatinine to calculate eGFR (equations 2 and 3 below, respectively).

On December 1, 2021, for all patients ≥ 18 years of age, Stanford Medicine will replace the CKD-EPI eGFR equation with the race coefficient with the new CKD-EPI Creatinine equation for eGFR Refit without race variable in the chemistry panels and point of care devices. In addition, a new eGFR panel called "Cystatin C- and refit without race variable Creatinine-Cystatin C- based eGFR" will also be implemented on the same day, including creatinine, cystatin C, and cystatin C, and creatinine-cystatin C based eGFR equations.

Equation 1

CKD-EPI Creatinine equation for eGFR Refit without race variable (2021) =

eGFR (mL/min/1.73 m2) = 142 × min (Scr /κ, 1) $^{\alpha}$ x max(Scr /κ, 1)$^{-1.200}$ x 0.9938^{Age} x 1.012 [if female]

where: Scr = serum creatinine in mg/dL,
κ = 0.7 for females and 0.9 for males,
α = -0.241 for females and -0.302 for males,
min = the minimum of Scr /κ or 1,
max = the maximum of Scr /κ or 1.

Equation 2

CKD-EPI Cystatin C equation for eGFR (2012) =

eGFR (mL/min/1.73 m2) = 133 × min (Scys / 0.8, 1) $^{-0.499}$ x max (Scys / 0.8, 1)$^{-1.328}$ x 0.996^{Age} x 0.932 [if female]

Equation 3

CKD-EPI Creatinine-Cystatin C equation for eGFR Refit without race variable (2021) =

eGFR (mL/min/1.73 m2) = 135 x min (Scr /κ, 1) $^{\alpha}$ x max (Scr /κ, 1)$^{-0.544}$ x min (Scys/ 0.8, 1)$^{-0.323}$ x max (Scys/ 0.8, 1)$^{-0.778}$ x 0.9961^{Age} x 0.963 [if female]

where: Scr = Serum Creatinine,
Scys = Serum Cystatin C,
κ = 0.7 for females and 0.9 for males,
α = -0.219 for females and -0.144 for males,
min = the minimum of Scr /κ or 1,
max = the maximum of Scr /κ or 1.

Cystatin C- and refit without race variable Creatinine-Cystatin C- based eGFR panel:

- EPIC Code: LABCYSTC
- Beaker Order code: CYSTC
- Refer to https://stanfordlab.com/test-directory.html for specimen requirements

References:

1. National Kidney Foundation. Removing Race from Estimates of Kidney Function [press release]. March 9, 2021. Accessed September 1, 2021. https://www.kidney.org/news/removing-race-estimates-kidney-function

2. Vyas DA, Eisenstein LG, Jones DS. Hidden in Plain Sight - Reconsidering the Use of Race Correction in Clinical Algorithms. N Engl J Med 2020; 383: 874-882.-.doi: 10.1056/NEJMms2004740. Epub 2020 Jun 17. PMID: 32853499.

3. Bragg-Gresham J, Zhang X, Le D, et al. Prevalence of Chronic Kidney Disease Among Black Individuals in the US After Removal of the Black Race Coefficient From a Glomerular Filtration Rate Estimating Equation. JAMA Netw Open 2021; 4:e2035636. doi: 10.1001/jamanetworkopen.2020.35636. PMID: 33512516; PMCID: PMC7846942.

4. Levey AS, Titan SM, Powe NR, et al. Kidney Disease, Race, and GFR Estimation. Clin J Am Soc Nephrol 2020; 15:1203- 1212. doi: 10.2215/CJN.12791019. Epub 2020 May 11. PMID: 32393465; PMCID: PMC7409747

5. Powe NR. Black Kidney Function Matters: Use or Misuse of Race? JAMA 2020; 324:737. doi: 10.1001/jama.2020.13378. PMID: 32761164.

6. Delgado C, Baweja M, Crews DC, et al. A unifying approach for GFR estimation: recommendations of the NKF-ASN task force on reassessing the inclusion of race in diagnosing kidney disease. J Am Soc Nephrol 2021 Sep 23:ASN.2021070988. doi: 10.1681/ASN.2021070988. Epub ahead of print. PMID: 34556489.

If you have any questions, please contact me at your earliest convenience.

Sincerely,

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