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Estimated Glomerular Filtration Rate

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TO THE EDITOR:

The recent article about estimated glomerular filtration rate (GFR) by Levey and colleagues (1) is remarkable. The authors suggest that the new equation may still have some bias and especially may have less precision in patients with GFRs greater than 60 mL/min per 1.73 m^2. This is even more important if the GFR is greater than 90 mL/min per 1.73 m^2 . In the paper's Methods section, Levey and colleagues do not give the analytic coefficient of variation (CV) of their assays (Beckman Synchron CX3 [Global Medical Instrumentation, Inc., Ramsey, Minnesota] and Roche/Hitachi P module Creatinase Plus enzymatic assay [Roche Diagnostics, Basel, Switzerland]). This information is important especially for low or normal creatinine values. Indeed, the concept of critical difference is familiar to clinical biologists but should perhaps be reminded to internists.

The critical difference of a biological variable includes the analytic CV and the intra-individual CV and is defined as the smallest change in a biological result that is not due to chance (2). The critical difference is calculated as follows: 1.414 x 1.96 x (analytic CV^2 + intra-individual $CV^2)^{0.5}$. The intra-individual CV of serum creatinine is 4% (3). The analytic CV of serum creatinine varies among the assays used and laboratories. An analytic CV of creatinine as low as 2% is rare but conceivable (4). With these CV values, the lowest critical difference for creatinine is 12%. A creatinine value of 70.7 μmol/L (0.8 mg/dL) is, thus, not different from values between 62.2 μmol/L (0.704 mg/dL) and 79.2 μmol/L (0.896 mg/dL). However, as we have illustrated (5), these differences are not negligible for GFR estimation if creatinine and GFR are normal because small creatinine changes induce large GFR variations within the range. If we take the example of a white 60-year-old man with a creatinine level of 70.7 μmol/L (0.8 mg/dL), the estimated GFR is 98.6 mL/min per 1.73 m^2 with the Modification of Diet in Renal Disease (MDRD) Study equation. If creatinine values of 62.2 μmol/L (0.704 mg/dL) and 79.2 μmol/L (0.896 mg/dL) are introduced, the results of the MDRD Study equations will be 114.3 mL/min per 1.73 m^2 and 86.5 mL/min per 1.73 m^2, respectively.

The low precision of the MDRD Study equation, when GFR is normal, is also linked to the precision of the creatinine assay and to the biological variation of creatinine. This assertion is true for all creatinine-based equations. We think that an improvement of the precision of the creatinine-based equation may be illusive in a nonrenal population. Clinicians should keep this fact in mind when they analyze an estimated GFR and when they longitudinally follow a serial of estimated GFRs in a patient with GFR greater than 60 mL/min per 1.73 m^2 . It is perhaps more cautious to still give MDRD Study equation results as more than 60 mL/min per 1.73 m^2 and 90 mL/min per 1.73 m^2 without giving precise absolute values of estimated GFR.

Potential Financial Conflicts of Interest:

None disclosed.

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