Relation of New and Old Formulas for Estimating Creatinine Clearance among Stroke Survivors

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Introduction

International consensus guidelines indicate that accurate identification of undiagnosed chronic kidney disease (CKD) could allow the initiation of treatments targeted at limiting further renal function deterioration, as well as reduce the risk of untoward vascular sequelae, including stroke [1, 2]. The widely recommended Modification of Diet in Renal Disease (MDRD) formula for calculating estimated glomerular filtration rate (GFR) or creatinine clearance, has been in use for 10 years [2, 3]. However, in May 2009, a new equation for estimating GFR, known as the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) Equation, was published, and it was suggested the CKD-EPI could replace the MDRD equation [4].

However, it is not clear whether GFR calculated by the newly proposed CKD-EPI equation would materially change CKD diagnosis made using the old formula [5]. This study aimed to assess the correlation between the MDRD and CKD-EPI formulas.

Materials and Methods

Data of subjects aged 55 and older, who participated in the National Health and Nutrition Examination Surveys (NHANES), a nationally representative sample of the civilian, noninstitutionalized US population from 1999 to 2004, were analyzed. Full details on NHANES procedures are published elsewhere [5]. This age cutoff has been used previously to reduce the proportion of per-
sons with strokes due to very unusual causes often seen at younger ages [5]. This analysis accounted for stratification, clustering and weighting according to the NHANES Analytic and Reporting Guidelines [6]. Abnormal GFR was defined as GFR <60 ml/min/1.73 m². GFR was calculated using the newly proposed CKD-EPI formula [4]. Strokes comprised both ischemic and hemorrhagic strokes.

**Results**

Among 6,382 adults surveyed (≥55 years of age), 5,321 (83%) responded to the interview question about stroke and had valid laboratory information on serum creatinine. Table 1 shows the summary statistics for GFR values calculated by both equations, with median and mean values fairly close to each other. Comparative frequencies for estimated GFR values ≥60 ml/min/1.73 m² and <60 ml/min/1.73 m² by the MDRD and CKD-EPI equations showed similar values between both equations. Using the 60 ml/min/1.73 m² cutoff point, there was 97.7% agreement [(1,209 + 3,991)/5,321], and assessment of the correlation between both equations showed an extremely high correlation (r = 0.954).

**Discussion**

Several laboratories around the country routinely report estimated GFR using the established MDRD formula along with serum creatinine to enhance early detection of CKD as recommended by the National Kidney Disease Education Program, National Kidney Foundation and the American Society of Nephrology [7]. This brief analysis observed a high degree of correlation between MDRD and the newly proposed CKD-EPI formula, which may suggest the new formula may not necessarily add substantial value to discriminating CKD in routine clinical practice.

**Conclusion**

Compared to the established formula, utilizing the newly proposed formula may not substantially change estimates of the prevalence of CKD among US stroke survivors or display a stronger association of CKD with stroke occurrence.

**Table 1.** Summary statistics of formulas for estimating GFR in a nationally representative (United States) sample of individuals aged ≥55 years

<table>
<thead>
<tr>
<th>GFR formula</th>
<th>n</th>
<th>Minimum</th>
<th>Lower quartile</th>
<th>Median</th>
<th>Mean</th>
<th>Upper quartile</th>
<th>Maximum</th>
<th>SD</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDRD</td>
<td>5,321</td>
<td>3.26</td>
<td>60.24</td>
<td>72.92</td>
<td>73.37</td>
<td>85.65</td>
<td>307.60</td>
<td>21.11</td>
<td>0.29</td>
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<tr>
<td>CKD-EPI</td>
<td>5,321</td>
<td>2.83</td>
<td>61.20</td>
<td>75.84</td>
<td>73.77</td>
<td>88.70</td>
<td>154.45</td>
<td>19.57</td>
<td>0.27</td>
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</table>

**References**