Differences between GFR Estimates using Cockcroft and Gault and MDRD Equations: Implications for Drug Dosing

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Background

- The MDRD formula has been shown to have greater accuracy and precision for estimation of the GFR (eGFR) when compared to the Cockcroft and Gault formula (C&G) for patients with renal impairment.
- However currently in Australia the majority of drug dosing advice is based on C&G1,2,3
- With a recommendation for the routine reporting of an eGFR with every serum creatinine request, it is important to evaluate the differences between these two methods for GFR estimation.

Aims

- To describe the population characteristics presenting to a private pathology service in Australia for creatinine measurement.
- To describe these characteristics with the population used to define the MDRD formula4.
- To investigate the relationship between estimates of GFR from the MDRD and Cockcroft and Gault formulae in this population.

Methods

- A data set of over 31,000 results for patients presenting at Southern IML Pathology for routine creatinine testing were available for analysis.
- Patients’ age, sex, height and weight were also collected. Patients were measured wearing clothes but without shoes.
- Creatinine was measured using the rate-blanked, compensated Jaffé method from Roche Diagnostics.
- The following variables were considered:
  • Using actual weight and ideal body weight estimated from height in C&G calculations.
  • MDRD “uncorrection” for BSA to give actual GFR.

- Note that no gold standard for GFR was available so the study is comparative only.

Formulae

**MDRD** - the abbreviated, or “4 variable” version of the MDRD was used.

eGFR = 186 x [([Scr] (mmol/L)) x 0.0113]1.154 x (age)0.203 x (0.742 if female). Units: mL/min/1.73m²

**Cockcroft and Gault**

Creatinine Clearance = (140-age) x Wt (kg) / (0.813 x Scr (mmol/L)). Units: mL/min.

Ideal Body Wt (kg) = 50 + 0.9 x (Ht (cm) -150) (-5 kg if female)

AMH version*: use lower of actual and ideal body weight

Therapeutic Guidelines version*: use actual weight unless BMI > 30, then use ideal body weight.

**Patient Demographics**

- The patient demographics for the data set are shown in table 1.

  **Table 1. Patient demographics for data set**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male</th>
<th>Female</th>
<th>Median</th>
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<td>MDRD</td>
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**Cockcroft and Gault Formula**

- The Cockcroft and Gault (C&G) formula is an estimate of creatinine clearance rather than of GFR.
- There is considerable variability in the result of the C&G equation depending on the estimate of patient weight used. Figure 1 shows the correlation between C&G based on actual body weight and C&G based on ideal body weight.
- Figure 2 shows the variation caused by two methods of choosing when to use ideal as opposed actual body weight.

**Effect of Age**

- The effect of various factors on the relationship between MDRD and C&G was explored. Age was the factor most associated with discrepancy between the formulae. As age increases the relative over-estimation of the MDRD compared to C&G increases (figure 3).

**MDRD v C&G**

- A direct comparison of MDRD and C&G results is shown in figure 2a and table 1a.
- Figure 2b and table 1b show the relationship between MDRD “uncorrected” for BSA and C&G.
- In both cases the AMH convention on weight choosing when to use ideal as opposed actual body weight.

**References**