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Cockcroft D W & Gault M H. Prediction of creatinine clearance from serum creatinine. *Nephron* 16:31-41, 1976. [Departments of Medicine, Queen Mary Veterans' Hospital, Montreal, Quebec, and Memorial University; St. John's, Newfoundland, Canada]

From 249 pairs of measured creatinine clearances in males, creatinine excretion (mg/kg) was found to decrease linearly with age. The linear regression of creatinine excretion against age led to development of a formula which can be used to successfully predict creatinine clearance from age, weight, and serum creatinine. [The *SCI*® indicates that this paper has been cited in more than 700 publications, making it the most-cited article published in this journal.]

Creatinine Clearance Prediction

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It is with amusement, that after almost 20 years as an academic "asthmatologist," that house officers recognize my name as that attached to the widely used "Cockcroft-Gault" formula for predicting creatinine clearance.

In 1972-1973, in order to do a third year of general medicine residency at the Royal Victoria Hospital (Montreal), two of my colleagues and I came up with an original idea; we each chose a medical subspecialty and rotated the three of ourselves through them. Thus, as a trainee interested in chest-allergy, I came to do a solitary three-month rotation as a subspecialty nephrology resident working with M.H. Gault at the Queen Mary Veterans' Hospital in Montreal. My first attempt at the customary small research project, a case report, proved unsuccessful. My second research project was to verify the accuracy of a nomogram which predicted creatinine clearance based on serum creatinine, age, and weight.[1] The investigation expanded to include a review of 505 pairs of measured endogenous creatinine clearance values in males. Of the 505, 249 pairs were reproducible and arbitrarily assumed to be "accurate." The 498 (249 x 2) data points were condensed by a "statistical trick" to 7 data points on a graph in which the mean creatinine excretion (mg/kg) for each decade was plotted against age. A striking negative linear correlation was seen. Following completion of clinical rounds on a cold Saturday morning in Montreal in February 1973, Gault and I were reviewing the graph and the linear regression of creatinine excretion vs. age, when I had the sudden revelation that this regression could be turned into a formula to predict creatinine clearance:

$$C_{cr} = \frac{(140 - \text{age})(\text{wt kg})}{72 \times S_{cr}\,(\text{mg/100mL})}$$

This formula yields results which are in reasonably good agreement with measurements obtained from 24-hour urine collections. It thus allows a quick and easy assessment of creatinine clearance as long as serum creatinine (thus renal function) is in a steady state. The performance of this formula and its "SI unit" equivalent re accuracy, advantages, and limitations has been recently reviewed.[2] The many references to this paper, often, as in some major textbooks, without explicit citation, appear to relate primarily to its value in drug kinetic studies.[3]

1. **Siersbaek-Nielsen K, Hansen J M, Kampmann J & Kristenson M.** Rapid evaluation of creatinine clearance. *Lancet* 1:1133-4, 1971. (Cited 245 times.)
2. **Gault M H, Longerich L L, Harnett J D & Wesolowski C.** Predicting glomerular function from adjusted serum creatinine. *Nephron* 62:249-56, 1992.
3. **Oates J A & Wilkinson G R.** Principles of drug therapy. (Wilson J D, Braunwald E, Isselbacher K J, Petersdorf R G, Martin J B, Fauci A S & Root R K. *eds.*) *Harrison's principles of internal medicine.* New York: McGraw Hill, 1991. p. 361-73.

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