

### **Renal Disease Calculations in SystmOne**

<https://www.gov.uk/drug-safety-update/prescribing-medicines-in-renal-impairment-using-the-appropriate-estimate-of-renal-function-to-avoid-the-risk-of-adverse-drug-reactions>

Estimated glomerular filtration rate (eGFR) and creatinine clearance (CrCl) are two estimates of renal function available to prescribers. Clinical laboratories routinely report renal function in adults based on eGFR normalised to a body surface area of 1.73 m<sup>2</sup>. For most drugs and most situations, eGFR is an acceptable estimate of renal function.

However, eGFR can overestimate renal function compared with CrCl in some patient groups or clinical situations. This overestimation can result in patients receiving higher than recommended doses of their medicine in relation to their renal function.

The MHRA advise:

- creatinine clearance should be calculated using the Cockcroft-Gault formula to determine dosage adjustments for:
  - direct-acting oral anticoagulants (DOACs)
  - patients taking nephrotoxic drugs (examples include vancomycin and amphotericin B)
  - elderly patients (aged 75 years and older)
  - patients at extremes of muscle mass (BMI <18 kg/m<sup>2</sup> or >40 kg/m<sup>2</sup>)
  - patients taking medicines that are largely renally excreted and have a narrow therapeutic index, such as digoxin and sotalol
- consult the Summary of Product Characteristics when dose adjustment based on CrCl is important and no advice is provided in the relevant BNF monograph
- reassess renal function and drug dosing in situations where eGFR and/or CrCl change rapidly, such as in patients with acute kidney injury (AKI)

Applications such as [MDCalc](#) provide the ability to use adjusted body weight, ideal body weight, or actual bodyweight as appropriate when calculating the Cockcroft-Gault CrCl value. The update to the SystmOne calculator now shows **the results of three calculations** for the creatinine clearance using the Cockcroft-Gault formula based on ideal, actual **and** adjusted weight.

**Controversy still exists over which form of weight is most appropriate to use. Caution of clinical judgement and extra interpretation may be required when the range falls within a dosage adjustment boundary.**

What did the previous SystmOne renal disease calculator use?

Previously the SystmOne calculator showed the result of **one** calculation for the creatinine clearance using the Cockcroft-Gault formula based on ideal, actual **or** adjusted weight. The weight used in the calculation depended upon the BMI of the patient:

Underweight - actual weight was used

Normal range - ideal weight was used

Overweight and obese - adjusted weight was used

This is the same as MDCalc:

As recommended by Brown et al and Winter et al, adjustments and estimates are made as follows:

Underweight	<a href="#">BMI</a> <18.5	Calculation uses <b>actual</b> /total body weight (i.e., no adjustment)
Normal weight	BMI 18.5-24.9	Calculation uses <b>ideal</b> body weight, range uses actual body weight
Overweight / obese	BMI ≥25	Calculation uses <b>adjusted</b> body weight, range uses ideal body weight

## DOACs

Where creatinine clearance is calculated to determine apixaban, edoxaban or rivaroxaban dose this should be done using the Cockcroft-Gault formula and ACTUAL body weight. NB. It is very important to ensure that up-to-date weight & creatinine are used. Actual body weight was used in the major DOAC clinical trials.

Dabigatran is used infrequently. If it is used the manufacturer's advice should be followed (see [https://www.derbyshiremedicinesmanagement.nhs.uk/assets/Clinical\\_Guidelines/Formulary\\_by\\_BNF\\_chapter\\_prescribing\\_guidelines/BNF\\_chapter\\_2/Atrial\\_fibrillation.pdf](https://www.derbyshiremedicinesmanagement.nhs.uk/assets/Clinical_Guidelines/Formulary_by_BNF_chapter_prescribing_guidelines/BNF_chapter_2/Atrial_fibrillation.pdf)).

For patients with a BMI >40kg/m<sup>2</sup> or those with weight >120 kg the evidence for using a DOAC is limited and warfarin may be the preferred option. For patients where warfarin is considered unsuitable and a DOAC is to be prescribed it is important to recognise that there is limited data on appropriate dosing in such patients and the Cockcroft-Gault equation may not be accurate for estimation of CrCl. Discuss treatment options with patient and consider seeking advice from your local anticoagulant service.