Surrey and North West Sussex Calculating Renal Function (Creatinine Clearance) When Monitoring Direct Oral Anticoagulants (DOACs) For Safe and Effective Dosing Of Patients

1) Use blood results from within the last month and bodyweight (BW) from within the last year (unless obvious significant weight loss/gain).

2) Use **ACTUAL bodyweight** to calculate creatinine clearance (CrCl) * note extremes bodyweight in point 5 below

3) Use the Cockcroft-Gault (CG) equation to estimate CrCl, to reduce the risk of over and under-coagulation:

MD+CALC: https://www.mdcalc.com/creatinine-clearance-cockcroft-gault-equation (MD+CALC can be downloaded as an app).

*NB. For primary care: EMIS users, the inbuilt CrCl calculator will correctly calculate renal function using actual bodyweight **only for patients on DOACs**. If DOAC prescribing has not yet been added clinicians must be aware that for BMI over 27 the CrCl displayed will show a result based on IBW followed by one for non-adjusted CrCl. Clinicians should use and record the non-adjusted (actual body weight) CrCl value to aid dosing decisions (see appendix 1 for example)*
For SystmOne, use the MD+CALC formula. For Vision, use the inbuilt CrCl calculator.

4) Do not use estimated glomerular filtration rate (eGFR) which may overestimate renal clearance, especially in elderly patients with low body weight/ body mass index.

5) Seek specialist advice from the local anticoagulation service or consider warfarin for:

- extremes of bodyweight **< 50kg, > 120kg or BMI ≥ 40kg/m^2** as drug level monitoring may be required (*at initiation of treatment and if clinically indicated*)
  NB. When calculating CrCl for these patients in primary care: *adjusted BW* for >120kg and *actual BW* for <50kg unless advised otherwise by anticoagulant clinic
- patients on dialysis and patients with a CrCl <15ml/min as DOACs are contraindicated
- heart failure patients with fluid overload- use dry weight/ euvolaemic estimate
- patients with extensive amputations, or neurological diseases (eg spina bifida, multiple sclerosis) and myopathy that may result in profound muscle loss.

6) Monitor renal function in line with the following recommendations:
** more frequent monitoring if clinically indicated/advised by specialist or concomitant nephrotoxic medications are prescribed**

Creatinine Clearance (CrCl)	Frequency of Renal Monitoring**
> 60ml/min	Every 12 months
30 to 60ml/min	Every 6 months
< 30ml/min	At least every 3 months (*dabigatran is contra-indicated*)▲
<15ml/min	All DOACs contraindicated - refer
Any patient ≥75 years OR frail±	At least every 6 months

±EHRA/ESC guidance 2018 recommends 6 monthly renal, liver function (LFT) and haemoglobin (Hb) monitoring for elderly and frail patients. Frailty should be assessed using any validated tool, for example the Electronic Frailty Index (eFI). https://www.england.nhs.uk/ourwork/clinical-policy/older-people/frailty/efi/
▲ Note previous trends if chronic kidney disease (CKD): More frequent monitoring may be needed in people with previous variable or erratic renal function, and less frequent monitoring may be needed for those with stable results: https://cks.nice.org.uk/chronic-kidney-disease
For acute kidney injury (AKI) see: https://www.thinkkidneys.nhs.uk/aki/wp-content/uploads/sites/2/2016/03/Guidelines-for-Medicines-optimisation-in-patients-with-AKI-final.pdf

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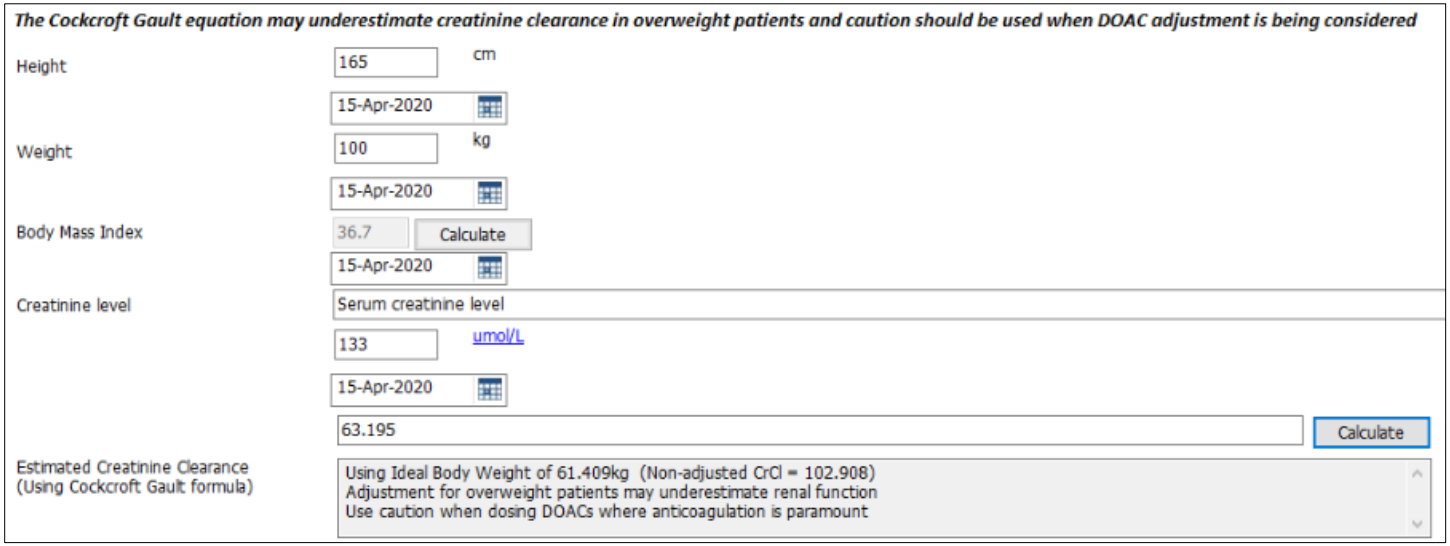
7) Refer to the individual drug summary of product characteristics (SPCs) concerning DOAC dosing for stroke prevention in non-valvular atrial fibrillation (NVAF):

Apixaban: https://www.medicines.org.uk/emc/search?q=%22apixaban%22
Dabigatran: https://www.medicines.org.uk/emc/search?q=dabigatran
Edoxaban: https://www.medicines.org.uk/emc/search?q=edoxaban
Rivaroxaban: https://www.medicines.org.uk/emc/search?q=rivaroxaban And/or
the British National Formulary: www.bnf.org or BNF Publications app.

Appendix 1 – Notes on using EMIS calculator for patients with BMI>27

The EMIS calculator will correctly calculate renal function using actual bodyweight for patients **on DOACs**, however, if the patient is **not yet on DOAC** in patients with BMI>27, EMIS calculator uses ideal body weight (IBW) to calculate CrCl and provides non-adjusted CrCl value in brackets – this is the value we want for actual body weight see below example:

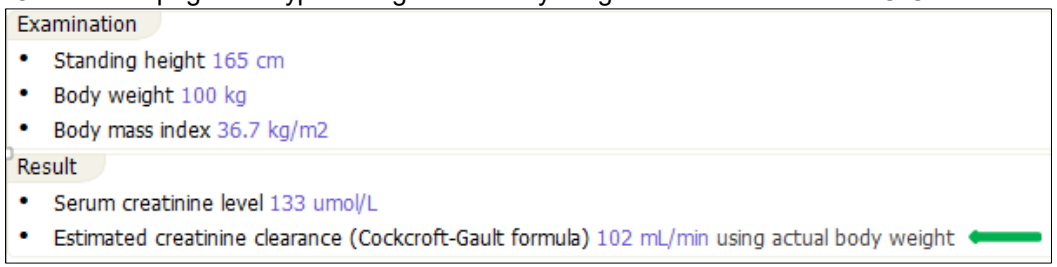


To correct this:

Delete the value calculated using IBW (63.195 in example)

Replace with the non-adjusted value =ABW (102.908 in example) in the box and save.

On the next page free type “using actual body weight” after the estimated CrCl.



Once saved, this will be recorded in the patient’s record:

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References:

- Electronic medicines compendium (summary of product characteristics SPC) for apixaban, dabigatran, edoxaban, rivaroxaban (www.medicines.org.uk)
- Specialist Pharmacy service: DOAC dosing in renal impairment v2; July 2019; www.sps.nhs.uk: https://www.sps.nhs.uk/wp-content/uploads/2019/07/DOAC-dosing-in-renal-impairment-vs2-July-2019-AW.pdf
- Specialist Pharmacy Service: Practice Guide to Dosing of Direct Acting Oral Anticoagulants in Patients with Renal Impairment; Nov 2018; www.sps.nhs.uk:
- https://www.anticoagulationuk.org/admin/resources/downloads/dosing-of-direct-oral-anticoagulants-doacs-in-renal-impairement.pdf
- Martin K, Beyer-Westendorf J, Davidson BL, Huisman MV, Sandset PM, Moll S. Use of the direct oral anticoagulants in obese patients: guidance from the SSC of the ISTH. J Thromb Haemost 2016; 14: 1308–13. *Last accessed 20/11/19*
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- Steffen J, Verhamme P, Potpara T et al; The 2018 European Heart Rhythm Association Practical Guide on the use of non-vitamin K antagonist oral anticoagulants in patients with atrial fibrillation; EHJ 21 April 2018; vol 39, issue 16: 1330-1393 (www.escardio.org) *last accessed 20/11/19*
- NHS England/UK Renal Registry: Guidelines for medicines optimisation in patients with acute kidney injury, March 2016; https://www.thinkkidneys.nhs.uk/aki/wp-content/uploads/sites/2/2016/03/Guidelines-for-Medicines-optimisation-in-patients-with-AKI-final.pdf
- NICE Guidance: Chronic Kidney Disease, last revised March 2019; https://cks.nice.org.uk/chronic-kidney-disease
- MHRA: Prescribing medicines in renal impairment: using the appropriate estimate of renal function to avoid the risk of adverse drug reactions (Oct 2019) 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 *last accessed 23/10/19*
- Rockwood K, Song X, MacKnight C, Bergman H, Hogan DB, McDowell I, Mitnitski A. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489–495. Canadian Study Of Health and Aging: Rockwood clinical frailty scale: https://www.cgakit.com/fr-1-rockwood-clinical-frailty-scale *last accessed 20/11/19.*
- CKS / NICE DOAC best practice monitoring https://cks.nice.org.uk/anticoagulation-oral#!management (last accessed 30/01/20)

Online references accessed 25/09/2019 unless specified

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