

## 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).
- 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 for patients on DOACs (but may not be accurate for initiating a DOAC). 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 for:
  - extremes of bodyweight **< 50kg or > 120kg** 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 Monitoring**
> 60ml/min	Every 12 months
30 to 60ml/min and/or aged >75 years and/or frail <sup>†</sup>	Every 6 months
< 30ml/min	At least every 3 months ( <i>dabigatran is contra-indicated</i> ) <sup>†</sup>
<15ml/min	All DOACs contraindicated - refer

±EHRA/ESC guidance 2018 recommends 6 monthly renal, liver function (LFT) and haemoglobin (Hb) monitoring for elderly and frail patients. See clinical frailty scale: <https://www.cgakit.com/fr-1-rockwood-clinical-frailty-scale>

<sup>†</sup> 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](http://www.bnf.org) or BNF Publications app.

### References:

- Electronic medicines compendium (summary of product characteristics SPC) for apixaban, dabigatran, edoxaban, rivaroxaban ([www.medicines.org.uk](http://www.medicines.org.uk))
- Specialist Pharmacy service: DOAC dosing in renal impairment v2; July 2019; [www.sps.nhs.uk](http://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](http://www.sps.nhs.uk): <https://www.anticoagulationuk.org/admin/resources/downloads/dosing-of-direct-oral-anticoagulants-doacs-in-renal-impairment.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*
- Schwartz J; Potential Effect of Substituting Estimated Glomerular Filtration Rate for Estimated Creatinine Clearance of Dosing of Direct Acting Oral Anticoagulants; *Journal of the American Geriatric Society* 2016; 64 (10); 1996-2002
- MacCallum P, Mathur R, Hull S et al; Patient Safety and Estimation of Renal Function in Patients Prescribed New Oral Anticoagulants for Stroke Prevention in Atrial Fibrillation: A cross sectional study; *BMJ* 2013 ([www.bmjopen.bmj.com](http://www.bmjopen.bmj.com))
- 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](http://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*.

**Online references accessed 25/09/2019 unless specified**

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