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±	Every 6 months
< 30ml/min	At least every 3 months (*dabigatran is contra-indicated*)▲
<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

▲ 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.

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:
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- 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