Elective Surgery in Adults on DOACs (Direct Oral Anticoagulants)

Peri-operative DOAC decision making should take into account the patient's underlying thrombotic risk (Appendix 1) and the bleeding risk associated with the surgery/procedure (Appendix 2). This should be discussed with the patient prior to the procedure, and the outcome of the discussion clearly documented. The form at the end of the document provides a template for the plan to be documented by a senior member of the clinical team.

Whilst the guidance that follows provides recommendations, they do not replace clinical judgement. Alternative plans can be made and documented by a senior clinician, including the decision as to which 'bleeding risk' recommendation to follow for a specific procedure.

Issues for surgery

- Risk of venous thromboembolism if omitted.
- Risk of cerebrovascular event (CVA) if omitted.
- Risk of bleeding and / or complications of bleeding if continued.

Timing of last DOAC intake before an elective intervention

Dosing of DOACs can be based on a number of factors, which includes renal function. It would be prudent to confirm that the patient is on the appropriate dose of DOAC (1). For example, rivaroxaban is not recommended if CrCl less than 15ml/min. See current product literature or seek advice if necessary.

DOACs have a predictable elimination half-life. If the decision is made to interrupt DOAC therapy, the patient's current renal function should be used to guide when to stop DOAC therapy.

The Cockroft-Gault formula is the preferred method for estimating renal function. See below or www.mdcalc.com†

$$\textbf{Estimated Creatinine Clearance (CrCl) (mL/min)} = \frac{\textbf{[140-age] x Weight x Constant}}{\textbf{Serum creatinine}}$$

- Age in years
- Weight in kg (Use ideal body weight. If the patient's actual body weight is less than their ideal body weight, actual body weight should be used instead.)
- Serum Creatinine in micromole/L
- Constant = 1.23 for men; 1.04 for women

Note: **Ideal body weight (kg) = Constant + 0.91 (Height – 152.4)** Where Height is in cm. Constant = 50 for men; 45.5 for women.

Bridging with therapeutic dose LMWH (Low Molecular Weight Heparin) is not required for patients on a DOAC (1,3)

Minor bleeding risk procedures can often be safely undertaken with DOAC interruption. A pragmatic approach would be to conduct the intervention 18-24 hours after the last DOAC intake (i.e. omit any DOAC doses due on the morning of the procedure) (1).

For management of Low- or High-risk procedures see following advice:
https://www.ukcpa-periophandbook.co.uk/medicine-monographs/direct-oral-anticoagulants-doacs

Figure 1: Number of doses of DOAC to be omitted prior to surgery or invasive procedures for which anticoagulation needs to be stopped (1,3)

See Appendix 2 for bleeding risk. Note -Where **spinal or epidural anaesthesia** is planned the 'High procedural bleeding risk' advice should be followed, irrespective of the bleeding risk of the procedure itself.

DOAC	Renal Function (CrCl, ml/min)	Estimated half-life (h)	Bleeding Risk of Procedure	Number of doses to be omitted prior to procedure (including any doses due on the morning of surgery – Day 0)					
				Day -5	Day -4	Day -3	Day -2	Day -1	Day 0
Apixaban	≥30	8	*HIGH*				Omit 5 doses		
			LOW					Omit 3 doses	
	<30		*HIGH*			Omit 7 doses			
			LOW				Omit 5 doses		
Dabigatran	≥50	15	*HIGH*				Omit 5 doses		
			LOW					Omit 3 doses	
	<50	18	*HIGH*		Omit 9 doses				
			LOW				Omit 5 doses		
Edoxaban	≥30	*10-14*	*HIGH*				MORNING dose- omit 3 doses EVENING dose – omit 2 doses		
			LOW					MORNING dose- omit 2 doses EVENING dose – omit 1 dose	
	<30		*HIGH*			MORNING dose- omit 4 doses EVENING dose – omit 3 doses			
			LOW				MORNING dose- omit 3 doses EVENING dose – omit 2 doses		
Rivaroxaban*	≥30	9	*HIGH*				MORNING dose- omit 3 doses EVENING dose – omit 2 doses		
			LOW					MORNING dose- omit 2 doses EVENING dose – omit 1 dose	
	<30		*HIGH*			MORNING dose- omit 4 doses EVENING dose – omit 3 doses			
			LOW				MORNING dose- omit 3 doses EVENING dose – omit 2 doses		

* Low dose Rivaroxaban (2.5mg Twice Daily) is licensed for use in conjunction with aspirin +/- clopidogrel for PAD/CAD. Pre-operative cessation of 2.5mg rivaroxaban should be managed on a case-by-case basis- see UKCPA peri-operative handbook.

† MDCalc is not a registered medical device. Healthcare professionals must exercise their own clinical judgement when using this tool to calculate creatinine clearance.

Post-operative Advice (1)

NB: All DOACs are rapidly absorbed and have a rapid onset of action, with peak anticoagulant activity at approximately 2-3 hours after oral ingestion. Attention to post-operative haemostasis is clinically important since too early resumption of DOACs, especially within 24 hours of surgery, is associated with a two- to fourfold increased risk of major bleeding.

Minor / Low Risk Procedures
Recommence 6 – 12 hours post-procedure if haemostasis has been fully secured.

High Risk Procedures / Increased Bleeding Risk
Do not recommence at full-dose until at least 48 hours post-procedure.

Prophylactic dose LMWH may be considered in the post-operative period prior to DOAC resumption. Prophylactic LMWH can be commenced 6-12 hours post-op based on patient's thromboembolic risk and bleeding risk.

Note: if patient has an epidural in situ, refer to GHNHSFT Policy A2165 ('Anticoagulants, Antiplatelets and spinal/epidural Anaesthesia) and VTE Prophylaxis Dosing Guideline.

LMWH should be discontinued immediately upon recommencing DOAC.

Appendix 1- Assessing Thrombotic risk

	Very High	High	Moderate
Chronic Atrial Fibrillation $CHADS_2$ score CHF 1 point Hypertension 1 point Age >75 1 point Diabetes 1 point Prior Stoke or TIA 2 points	stroke or TIA within 3 months rheumatic valvular heart disease $CHADS_2$ score >4	$CHADS_2$ score =3 or 4 Stroke or TIA > 3 months prior	$CHADS_2$ score ≤2 and no prior stroke or TIA
Venous Thromboembolism (if VTE within 3 months consider postponing surgery or placing an IVC filter)	VTE within 3 months Severe thrombophilia (active cancer, antiphospholipid syndrome, deficiency of protein C, protein S or Antithrombin, multiple thrombophilia) (antithrombin deficiency should be referred to haematology) recurrence of VTE on anticoagulation	VTE within 3-12 months VTE on long-term anticoagulant therapy cancer therapy within 6 months or active disease (patients usually on LMWH) Non-severe thrombophilia (heterozygous for Factor V Leiden or prothrombin gene mutation)	VTE > 12 months prior and no other risk factors (patients with previous VTE not on anticoagulation should follow the thromboprophylaxis protocol)

Appendix 2- Assessing bleeding risk

This is often a very individual statistic: the risk of performing this particular procedure in this patient. For each patient, individual factors relating to bleeding and thrombotic risk (e.g. age, stroke risk, renal function, co-medications (e.g. anti-platelets, NSAIDs) need to be taken into account and be discussed with the surgeon and the patient.

Dosing of DOACs can be based on a number of factors, which includes renal function. It would be prudent to confirm that the patient is on the appropriate dose of DOAC (1). See current product literature or seek advice if necessary.

The table below provides some broad guidance as to the bleeding risk described in large studies (2,3).

Minor bleeding risk *	**Low procedural bleeding risk (bleeding infrequent or of low clinical impact)***	**High procedural bleeding risk (bleeding frequent and/or of high impact)**
Cataract or glaucoma intervention	Carpal tunnel repair	**Spinal or epidural anaesthesia****; lumbar diagnostic puncture
Superficial surgery e.g. abscess incision; small dermatologic excision, skin biopsy	Pacemaker or ICD implantation (except complex procedures)	Cardiac surgery; complex invasive cardiological interventions, including lead extraction, VT ablation, chronic total occlusion PCI
Simple dental surgery (simple 1-3 extractions, abscess incision)	Paradontal surgery, implant positioning	Neurosurgery
Low bleeding risk endoscopic procedure e.g. without resection or biopsy	GI endoscopy (with simple biopsy), enteroscopy, biliary/pancreatic stent (without sphincterotomy)	Certain GI procedures (e.g. polypectomy, variceal treatment, biliary sphincterotomy, PEG placement)
	Many biopsies (bladder, thyroid, breast or lymph node)	Major urologic surgery e.g. TURP/ biopsy (including kidney)
	Central line removal	Surgery not specified in minor or low procedural risk (vascular, general, major orthopaedic surgery, thoracic surgery)
	Abdominal hernia repair	Multiple tooth extractions
	Shoulder/Foot/Hand surgery Knee/Hip replacement Arthroscopy	

*Minor bleeding risk e.g. low bleeding risk endoscopic procedures- see UKCPA peri-operative handbook

Where **spinal or epidural anaesthesia is planned the 'High procedural bleeding risk' advice should be followed, irrespective of the bleeding risk of the procedure itself.

Continuation of DOACs in patients who receive neuraxial anaesthesia is not recommended due to the risk of spinal haematoma.

Patients who have epidural or paravertebral catheters in place should not be started on long-acting anticoagulants until the catheter has been safely removed and an acceptable time has elapsed.

Appendix 3: Perioperative DOAC patient information leaflet. Note plan should also be printed and signed by Consultant Anaesthetist for inclusion in POAC plan

Instructions for taking apixaban, dabigatran, edoxaban or rivaroxaban before and after your operation

Procedure Consultant Patient weight Renal Function (Creatinine Clearance) ml/min	Patient Name Label

Medication	
Dose and time normally taken	
Miss _____ doses before your operation. Miss _____ doses after your operation then restart (unless your surgeon says otherwise)	

Please complete as appropriate. i.e. Last dose =

	DATE	MORNING	EVENING
4 days before operation	/ /		
3 days before operation	/ /		
2 days before operation	/ /		
1 day before operation	/ /		
Day of operation	/ /		
1 day after operation	/ /		
2 days after operation	/ /		
3 days after operation	/ /		

Signed:

Print Name: Date:

If your operation is cancelled or the date is changed please contact us for advice on-.....

References

1) The Handbook of Perioperative Medicines. UKCPA. https://www.ukcpa-periophandbook.co.uk/

2) Spyropoulous C., Douketis, J. How I treat anticoagulated patients undergoing elective procedure or surgery. *Blood* October 2012 Vol 120 (15)

3) 2021 European Heart Rhythm Association Practical Guide on the Use of Non-Vitamin K Antagonist oral anticoagulants in patients with Atrial Fibrillation. *European Society of Cardiology*. Europace (2021) **00**, 1-65

4) Douketis JD, Spyropoulios AC, Carrier M *et al*. Perioperative Management of Patients with Atrial Fibrillation Receiving a Direct Oral Anticoagulant. JAMA Internal Medicine. 2019. PAUSE study

5) Peri-operative management of anticoagulant and antiplatelet therapy. Keeling et al. British Journal of Haematology 2016 175: 602-613