Gloucestershire Hospitals NHS
NHS Foundation Trust

Document	Newer Anticoagulants and Elective Procedures
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Elective Surgery in Adults on Novel Anticoagulants (NOACs)

Gloucestershire Hospitals NHS
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Assess Patient's thrombotic risk

LOW

AF with CHADS-2 score of 2 or less, with no prior stroke or TIA

MODERATE

AF with CHADS-2 score of 3 or 4

VTE within 3-12 months
VTE previously, on long term anticoagulation
VTE with active cancer, or within 6m of cancer therapy

HIGH (delay if will lower risk, and is safe)

AF with Stroke or TIA within 6 months
Rheumatic valvular heart disease with AF
AF with CHADS-2 score 5 or 6

VTE within last 3 months
Antiphospholipid syndrome
Severe heritable thrombophilia
Recurrence of VTE whilst on Anticoagulation

Assess bleeding risk of procedure

HIGH Bleeding Risk

LOW Bleeding Risk

Document Patient's weight and creatinine; Calculate Creatinine Clearance

Is an epidural or spinal anaesthetic planned? Use tables to decide on which day last dose of NOAC is given.

Spinal or epidural PLANNED

CrCl	Dabigatran	Rivaroxaban	Apixaban
50+	Day-4	Day-3	Day-3
30-50	Day-5	Day-3	Day-4
Below 30		Day-4	

NO spinal or epidural planned

CrCl (ml/min)	Dabigatran		Rivaroxaban		Apixaban	
	Low bleeding risk	High bleeding risk	Low bleeding risk	High bleeding risk	Low bleeding risk	High bleeding risk
50+	Day-2	Day-3	Day-2	Day-3	Day-2	Day-3
30-50	Day-3	Day-4	Day-2	Day-3	Day-3	Day-4
Below 30			Day-3	Day-4		

Is the patient HIGH thrombotic risk?

Yes

Bridging LMWH

Consider treatment dose LMWH if last dose NOAC on day-3 or before (Fragmin, or Clexane 1mg/kg od if CrCl<30).
Give at 18.00, day after last dose NOAC (including giving treatment dose LMWH on day-2).

Give prophylactic dose LMWH at 18.00 night before surgery (day-1)

No

On day of procedure OMIT both NOAC and any form of LMWH before procedure; if haemostasis secure, and surgeon happy, begin prophylactic LMWH after

Continue prophylactic LMWH till NOAC has been restarted

LOW Bleeding risk Procedure
Consider restart on Day+1 or Day+2

HIGH Bleeding risk Procedure
Consider restart on Day+2 or Day+3

Newer Anticoagulants and Elective Procedures

The newer anticoagulants (Dabigatran, Rivaroxaban and Apixaban) are increasingly prescribed in patients to reduce thrombotic risk in those with atrial fibrillation and venous thrombosis. When elective procedures are planned it is important to consider the relative risks and consequences of discontinuing anticoagulation in these patients, and to weigh this against the frequency and consequence of bleeding during the procedure should there be residual anticoagulant effect. This should be discussed with the patient prior to the procedure, and the outcome of the discussion clearly documented. The forms at the end of the document provide a template for the plan to be documented by a senior member of the clinical team.

These drugs have relatively short half-lives in most patients, with predictable onset of action, obtaining therapeutic levels of anticoagulation within a few hours of being administered (unlike warfarin). At present there is no readily available test to establish level of anticoagulation (such as the INR with warfarin), nor is there a specific reversal agent should the patient begin to bleed, though this is uncommon. Further advice is available from the Trust guideline 'Managing bleeding patients on anticoagulants', or from the on-call Haematologist.

Assessing Thrombotic Risk([1])

	High	Moderate	Low
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 6 months rheumatic valvular heart disease $CHADS_2$ score =5 or 6	$CHADS_2$ score =3 or 4	$CHADS_2$ score ≤2 + no prior stroke or TIA
Venous Thromboembolism (if VTE within 3 months consider postponing surgery or placing an IVC filter)	VTE within 3 months antiphospholipid syndrome (venous or arterial thrombosis) or severe heritable 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)	(patients with previous VTE not on anticoagulation should follow the thromboprophylaxis protocol)

Assessing Bleeding Risk

This is often a very individual statistic: the risk of performing this particular procedure in this patient. The operator will therefore be best placed to assign the procedure a risk, deciding when to stop anticoagulation before and when to start full anticoagulation following the procedure. The table below, from reference 2, provides some broad guidance as to the bleeding risk described in large studies.

Low procedural bleeding risk (2-day risk of major bleed 0-2%)	**High procedural bleeding risk (2-day risk of major bleed 2-4%)**
Cholecystectomy	Any major operation (procedure duration >45 mins)
Abdominal hysterectomy	TURP
GI Endoscopy (+/- biopsy), enteroscopy, biliary/pancreatic stent (without sphincterotomy)	Certain GI procedures (polypectomy, variceal treatment, biliary sphincterotomy, PEG placement)
Pacemaker and defibrillator insertion	Multiple tooth extractions
Simple dental extractions	Surgery not specified in Low procedural risk (Vascular, General, Ortho)
Carpal tunnel repair	
Knee/Hip replacement	
Shoulder/Foot/Hand surgery	
Arthroscopy	
Skin cancer excision	
Abdominal hernia repair	
Cataract and non-cataract eye surgery	
Non-coronary angiography	
Bronchoscopy (+/- biopsy)	
Central line removal	
Many biopsies (bladder, prostrate, thyroid, breast or lymph node)	

Establishing a course of action

It is clearly important to balance the risk of thrombosis and haemorrhage; a patient with atrial fibrillation and a low CHADS-2 score can safely discontinue anticoagulant many days before even a low bleeding risk procedure, whilst a high risk patient undergoing a low bleeding risk procedure may begin the procedure with a degree of residual anticoagulation, permitting a degree of additional bleeding in a non-critical site to provide a greater degree of thrombotic protection.

Whilst the guidance that follows provide recommended plans for each of the new anticoagulants they do not replace clinical judgment: they will never replace a thorough assessment of a patient by an experienced clinician. Alternative plans can be made and documented by a senior clinician, modifying the forms as necessary, including the decision as to which ‘bleeding risk’ recommendation to follow for a specific procedure

Renal Function

Most studies and guidance materials covering bleeding risk with the new agents provide advice with reference to a patient's calculated creatinine clearance (CrCl), not an eGFR. This is most frequently by the Cockcroft-Gault method. Using the patient's age, weight, sex and creatinine a more reliable creatinine clearance can be calculated. ([4]) Free calculators can be found on the internet, or as smartphone apps (remember to select umol/L units for creatinine). Use of this calculation is recommended to more reliably predict drug wash-out times.

Neuraxial Anaesthesia (and lumbar puncture)

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, for both Rivaroxaban- and Apixaban-treated patients. Dabigatran-treated patients require a further 24 hours without anticoagulation, in addition to the 'high procedural bleeding risk' time ([3]).

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

For all three newer agents (Dabigatran, Rivaroxaban and Apixaban) at least six hours should elapse following catheter removal before a dose is administered ([3]). A delay of 24 hours should occur if the procedure was traumatic (a 'bloody tap').

High Thrombotic Risk Surgery

Patients in the HIGH thrombotic risk category have a greater risk of significant morbidity and mortality during the period without anticoagulation. If the risk will reduce by postponing the procedure (e.g. by waiting till 3 months following VTE event) this should be considered, where it is not thought to compromise clinical care in other ways. Where surgery cannot safely be delayed, the risk of thrombosis can potentially be reduced by using bridging LMWH (see flow chart at start of document).

Emergency Surgery

There will clearly be times when a procedure is required at short notice, when these anticoagulants cannot be stopped electively (e.g. laparotomy for peritonitis). These drugs have short half-lives, but no direct reversal agents, and a decision must be made by a senior clinician as to when to undertake the procedure. By 24 hours the levels will have fallen to around 25% activity or less in most patients with reasonable renal function.

Where delay is not feasible or sensible, several general principles may reduce bleeding risk or consequence further:

1. If recently taken dose (within 2 hours) consider the potential benefit of activated charcoal to reduce absorption.
2. Consider alternative approaches where possible (considering bleed risk and consequence of bleed at that site), for example endoscopic intervention or interventional radiology
3. Give tranexamic acid 1g IV and then 8-hourly, to improve clot formation
4. Ensure platelet count >50-70x 10^9/L, and consider platelet transfusion if receiving antiplatelet therapy, such as aspirin or clopidogrel (though co-prescription is unusual)
5. Maximise pre-operative haemoglobin – consider red cell transfusion
6. If despite these measures there is significant peri- or post-operative bleeding consider the use of prothrombin complex concentrate (25-50 units/kg), in discussion with Consultant Haematologist.

References

1. Warfarin and Elective surgery guidelines, GHNHSFT
2. Spyropoulous C. Douketis J. How I treat anticoagulated patients undergoing elective procedure or surgery. *Blood* October 2012. Vol 120. Number 15
3. Harrop-Griffiths W. et al. Guidelines: Regional anaesthesia and patients with abnormalities of coagulation. *Anaesthesia* 2013, 68, 966-972

4. CrCl (mL/min) = $\frac{N \times [140\text{-age (years)}] \times \text{weight (kg)}}{\text{Serum creatinine (micromol/L)}}$

   Where N = 1.23 males, 1.04 females

PERIOPERATIVE DABIGATRAN PLAN

Thrombotic risk	HIGH	MODERATE	LOW

Weight (kg)		CrCl†		Date	

Name	(or sticker)
MRN	
Dob	

CrCl†	Half-life (hr)	Last Dose in low Bleeding risk procedure	Last dose in high bleeding risk procedure	Spinal/ Epidural anaesthetic
80+	13	Day -2 or before	Day -3 or before	48 hr+
50-80	15	Day -2 or before	Day -3 or before	72 hr+
30-50	18	Day -3 or before	Day -4/ Day -5	96 hr+

Procedure	
Consultant	
Date	

†Calculated Creatinine clearance (CrCl) using Cockroft-Gault formula, not eGFR

(Complete boxes below as appropriate; Give Dabigatran or omit, Prophylactic or Treatment-dose heparin)

Day -4	Day -3	Day -2	Day -1	Day of Procedure	Day +1	Day +2	Day +3
				NO DABIGATRAN Proph.LMWH after			

ANTICOAGULATION FOLLOWING PROCEDURE	
Consider prophylactic LMWH from night of procedure onwards, till Dabigatran given	
Low bleeding risk procedure	Consider Dabigatran 24 hours post-procedure, if haemostasis secure
High bleeding risk procedure	Consider Dabigatran 48-72 hours post-procedure, if haemostasis secure

Signed	
Print Name	
Bleep/Mob	
Date	

PERIOPERATIVE RIVAROXABAN PLAN

Name	(or sticker)
MRN	
Dob	

Indication		AF	VTE
Thrombotic risk	HIGH	MODERATE	LOW

Weight (kg)		CrCl†		Date	

†Calculated Creatinine Clearance (CrCl) using Cockroft-Gault formula, not eGFR

CrCl†	Half-life (hr)	Last Dose in low Bleeding risk procedure	Last dose in high bleeding risk procedure
30+	8-9	Day -2 or before	Day -3 or before
Under 30	9-10	Day -3 or before	Day -4 or before

Procedure	
Consultant	
Date	

For spinal anaesthesia follow high bleeding risk advice

(Complete boxes below as appropriate; Give Rivaroxaban or omit, Prophylactic or Treatment-dose heparin)

Day -4	Day -3	Day -2	Day -1	Day of Procedure	Day +1	Day +2	Day +3
				NO RIVAROXABAN Proph.LMWH after			

ANTICOAGULATION FOLLOWING PROCEDURE	
Consider prophylactic LMWH from night of procedure onwards, till Rivaroxaban given	
Low bleeding risk procedure	Begin Rivaroxaban 24 hours post-procedure, if haemostasis secure
High bleeding risk procedure	Begin Rivaroxaban 48-72 hours post-procedure, if haemostasis secure

Signed	
Print Name	
Bleep/Mob	
Date	

PERIOPERATIVE APIXABAN PLAN

Thrombotic risk	HIGH	MODERATE	LOW

Weight (kg)		CrCl†		Date	

CrCl†	Half-life (hr)	Last Dose in low Bleeding risk procedure	Last dose in high bleeding risk procedure
50+	7-8	Day -2 or before	Day -3 or before
30-50	17-18	Day -3 or before	Day -4 or before

Name	(or sticker)
MRN	
Dob	

Procedure	
Consultant	
Date	

For spinal anaesthesia follow high bleeding risk advice

†Calculated CrCl using Cockroft-Gault formula, not eGFR

(Complete boxes below as appropriate; Give Apixaban or omit, Prophylactic or Treatment-dose heparin)

Day -4	Day -3	Day -2	Day -1	Day of Procedure	Day +1	Day +2	Day +3
				NO APIXABAN Proph.LMWH after			

ANTICOAGULATION FOLLOWING PROCEDURE	
Consider prophylactic LMWH from night of procedure onwards, till Apixaban given	
Low bleeding risk procedure	Consider Apixaban 24 hours post-procedure, if haemostasis secure
High bleeding risk procedure	Consider Apixaban 48-72 hours post-procedure, if haemostasis secure

Signed	
Print Name	
Bleep/Mob	
Date	