4.7 Algorithm for the Peri-operative Management of Anticoagulants and Antiplatelet agents in Adult patients

Assess Thrombosis risk: baseline risk in an individual patient plus additional thrombotic risk from procedure (Algorithm 1)

**LOW RISK**
1. VTE with target INR 2.0-3.0 unless:
   - VTE in prior 3 months
   - Associated with Malignancy
2. Non-valvular AF with target INR 2.0-3.0 unless:
   - Previous stroke or TIA
   - CHA2DS2VASc score of 5 or 6
3. Bileaflet mechanical Aortic valves* with no additional risk factors§

**MODERATE RISK**
1. VTE provoked by malignancy
2. Low risk thrombophilia with previous VTE¥

**HIGH RISK**
1. VTE in prior 6-12 weeks
2. Aortic caged ball/disc heart valves*
3. Bileaflet aortic valve with additional risk factors*
4. Any mechanical valve with previous stroke / TIA
5. Non-valvular AF with CHA2DS2VASc score of 5 or 6
6. AF with previous stroke / TIA (Avoid surgery within 3 months where possible)
7. Valvular heart disease
8. High risk thrombophilia¶
9. Any indication with target INR 3.0-4.0

**VERY HIGH RISK**
- VTE in prior 6 weeks
- Metallic Mitral Valves*

Assess Bleeding risk: baseline risk in an individual patient plus additional bleeding risk from procedure (Algorithm 2)

**LOW RISK**
(Interventions not necessarily requiring discontinuation of anticoagulant)

Dental Interventions:
- Extraction of 1-3 teeth
- Periodontal surgery
- Incision of abscess
- Implant positioning

Cardiac device insertion:
- Pacemaker/ICD/CRT

Ophthalmology:
- Cataract / Glaucoma intervention
- Endoscopy without biopsy

Endoscopy with biopsy
Prostate or bladder biopsy
Electrophysiological study or radiofrequency catheter ablation for Supraventricular tachycardia
Angiography

**STANDARD RISK**

**HIGH RISK**
- Complex left side ablation
- Spinal or epidural anaesthesia
- Lumbar puncture
- Thoracic surgery
- Abdominal surgery
- Major orthopaedic surgery
- Kidney biopsy

* All patients with mechanical heart valves must be discussed with their Cardiologist as soon as possible after their preoperative assessment
§ AF, previous CVA / TIA, hypertension, diabetes, congestive heart failure, >75 years
¥ Heterozygote Factor V Leiden, heterozygote prothrombin mutation
¶ Protein C, Protein S or Antithrombin deficiency, Antiphospholipid syndrome, multiple thrombophilies
Algorithm for Managing Anticoagulation Perioperatively

Assess patients at least 14 days before surgery

Is the patient prescribed: an Anticoagulant? Or an Antiplatelet?

Anticoagulants

- VKAs: Warfarin, Acenocoumarol and Phenindione
  - See Appendix 1

- DOACs: Rivaroxaban, Apixaban and Dabigatran
  - See Appendix 2

- Parenteral anticoagulation: Fragmin and Fondaparinux
  - See Appendix 3

Antiplatelets

- Aspirin/Prasugrel, Dipyridamole, Clopidogrel/Ticagelar
  - See Appendix 4

Perioperative management proforma must be completed and given to Patient, copy sent to GP, Surgeon / Operator and a copy filed in the Patient's notes:

- The proforma should contain calendar outlining the Perioperative timing of:
  - Anticoagulant and Antiplatelet discontinuation and resumption
  - Dose and timing of LMWH bridging (where relevant)
  - INR measurement schedule (where relevant)

- All patients or caregivers must receive adequate education on injection technique when outpatient LMWH bridging is administered.
- Ensure sharps bins are provided
- Ensure contact details are available in case of bleeding or queries
The target INR must be stipulated by the team carrying out the invasive procedure. If required INR is less than the target range:
- Weigh patient and calculate creatinine clearance (CrCl) (not estimated GFR)
- If metallic heart valve discuss with Cardiology prior to proceeding; if dialysis patient discuss with Renal team

Assess Thrombotic risk utilising Algorithm 1
Pre-operative Management:

LOW RISK
1. Stop Warfarin 5 days before surgery to allow INR to normalise
2. Take INR 1 day prior (ideally) or the morning of the procedure (urgently)
3. If INR is higher than required by Operator then discuss with Consultant Haematologist / Haematology SpR for advice regarding dose of Vitamin K

MODERATE RISK
1. Stop Warfarin 5 days before surgery to allow INR to normalise
2. Start prophylactic dose (usually 5 000u) Dalteparin 3 days pre-operatively (prescribe 08.00h)
3. Take INR 1 day prior (ideally) or the morning of the procedure (urgently)
4. If INR is higher than required by Operator then discuss with Consultant Haematologist/Haematology SpR for advice regarding dose of Vitamin K
5. On day of procedure omit LMWH dose at 08.00h

HIGH RISK
1. Stop Warfarin 5 days before surgery to allow INR to normalise
2. Start treatment dose Dalteparin 3 days pre-operatively (prescribe 08.00h) ** Use Table 1 for Dalteparin dose.
   - If UFH required admit patient 3 days pre-operatively (use Trust Guideline: Use of intravenous heparin)
   - If CrCl <50ml/min omit for 48h i.e. no fragmin on day of operation or day prior to operation
3. Take INR 1 day prior (ideally) or the morning of the procedure (urgently)
4. If INR is higher than required by Operator then discuss with Consultant Haematologist/Haematology SpR for advice regarding dose of Vitamin K
5. On day of procedure omit LMWH dose at 08.00h. If CrCl<50ml/min omit for 48hrs. If UFH used, stop 6 hours prior to procedure (APTT not required)

VERY HIGH RISK
1. VTE in prior 6 weeks: Ideally avoid surgery
   - Consider use of temporary Inferior Vena Cava (IVC) Filter. Refer to guidelines ‘Algorithm for Insertion of Retrievable Vena Caval Filters’
   - Then manage as per High risk (see above)
2. Metallic Mitral Valves
   - All patients with Metallic Heart valves should be discussed with their Cardiologist prior to surgery. LMWH is unlicensed in metallic valves; UFH may be preferable
   - Then manage as per High risk (see above)
### Post-operative Management:

#### LOW RISK
1. Consider prophylactic dose Dalteparin post-operatively as per MTW VTE prevention guidelines.
2. Recomence usual Warfarin dose on evening of surgery if no excessive bleeding. This must be discussed with a Surgeon.

#### MODERATE RISK
1. Restart LMWH or UFH 6-8 hours post-operatively if haemostasis secure.
2. If epidural or spinal blockade used, treatment dose LMWH or UFH should be restarted at least 12 hours post catheter removal - this should be delayed to 24 hours if traumatic epidural insertion.
   - **If bleeding occurs (or high risk of bleeding)** post operatively then it may be necessary to delay recommencement of anticoagulation OR use prophylactic Dalteparin doses OR UFH infusion until bleeding risk diminishes.
   - **If bleeding risk intermediate / low** then use split doses of Dalteparin (50% therapeutic dose twice daily) for first few days post-operatively (and then recommence once daily dosing as bleeding risk diminishes).
   - Prophylactic doses of Dalteparin may be used in patients with lower thrombotic risk.
3. Recomence usual Warfarin dose on evening of surgery if no excessive bleeding. Continue Dalteparin or UFH until target INR reached.

#### HIGH RISK
1. Restart LMWH of UFH 6-8 hours post-operatively if haemostasis secure.
2. If epidural or spinal blockade, treatment dose LMWH or UFH should be restarted at least 12 hours post catheter removal - this should be delayed to 24 hours if traumatic epidural insertion.
   - **If bleeding occurs (or high risk of bleeding)** post operatively then it may be necessary to delay recommencement of anticoagulation OR use prophylactic Dalteparin doses OR UFH infusion until bleeding risk diminishes.
   - **If bleeding risk intermediate / low** then use split doses of Dalteparin (50% therapeutic dose twice daily) for first few days post-operatively (and then recommence once daily dosing as bleeding risk diminishes).
3. Recomence usual Warfarin dose on evening of surgery if no excessive bleeding. Continue Dalteparin or UFH until target INR reached.

#### VERY HIGH RISK
1. VTE in prior 6 weeks
   - Manage as per High risk (see above).
2. Metallic Mitral Valves
   - Manage as per High risk (see above).
Algorithm for Managing Patients on DOACs (Rivaroxaban, Apixaban and Dabigatran)

Appendix 2

Weigh patient and calculate Creatinine Clearance (CrCl) **not** estimated GFR

Assess Thrombotic and Bleeding risks utilising Algorithms 1 and 2 respectively

Pre-operative Management: When to Stop DOACs before a planned surgical intervention:

- **Low risk:** i.e. DOAC may not need to be discontinued
  - Perform procedure at trough level of DOAC
  - Consider scheduling intervention 18-24hrs after last intake and restart 6hrs later (equivalent of missing 1 dose Apixaban)

<table>
<thead>
<tr>
<th>CrCl (min/ml)</th>
<th>DABIGATRAN</th>
<th>APIXABAN</th>
<th>RIVAROXABAN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard</td>
<td>High</td>
<td>Standard</td>
</tr>
<tr>
<td>≥ 80</td>
<td>≥ 24h</td>
<td>≥ 48h</td>
<td>≥ 24h</td>
</tr>
<tr>
<td>50 - 80</td>
<td>≥ 36h</td>
<td>≥ 72h</td>
<td>≥ 24h</td>
</tr>
<tr>
<td>30 - 50</td>
<td>≥ 48h</td>
<td>≥ 96h</td>
<td>≥ 24h</td>
</tr>
<tr>
<td>15 - 30</td>
<td>Contraindicated</td>
<td>≥ 48h</td>
<td>≥ 72h</td>
</tr>
<tr>
<td>&lt; 15</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
</tr>
</tbody>
</table>

Post-operative Management: When to restart DOACs post surgical intervention dependent on bleeding risk:

- **STANDARD RISK**
  - **DABIGATRAN:** Resume 24 hr post-operatively at normal dose. If patient has high VTE risk consider prophylactic dose of LMWH on evening of surgery
  - **RIVAROXABAN:** Resume 24 hr post-operatively at normal dose. If patient has high VTE risk consider prophylactic dose of LMWH on evening of surgery
  - **APIXABAN:** Resume 24 hr post-operatively at normal dose. If patient has high VTE risk consider prophylactic dose of LMWH on evening of surgery

- **HIGH RISK**
  - **DABIGATRAN:** Prescribe thromboprophylaxis as per VTE risk assessment. Convert to full anticoagulation 2-3 days post operatively at normal dose
  - **RIVAROXABAN:** Prescribe thromboprophylaxis as per VTE risk assessment. Convert to full anticoagulation 2-3 days post operatively at normal dose
  - **APIXABAN:** Prescribe thromboprophylaxis as per VTE risk assessment. Convert to full anticoagulation 2-3 days post operatively at normal dose
Algorithm for Managing Patients on Long Term Parenteral Anticoagulants (Fragmin and Fondaparinux)  Appendix 3

Patients on LMWH (usually Fragmin at MTW)

All patients should have Creatinine Clearance (CrCl) (not estimated GFR) calculated at pre-operative assessment

<table>
<thead>
<tr>
<th>CrCl &gt; 50ml/min</th>
<th>CrCl 30-50ml/min</th>
<th>CrCl &lt; 30ml/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients should be advised to inject their LMWH as early in the morning as feasible. Omit dose of day of procedure.</td>
<td>Patients should be discussed with a Consultant Haematologist. Send trough anti-Xa level (1 x citrate tube, light blues) to ensure no accumulation of LMWH. Usually stop for 48h prior to procedure i.e. miss 2 doses.</td>
<td>Patients should be discussed with a Consultant Haematologist. A trough Anti-Xa level should be sent as a matter of urgency (1x citrate tube, light blue) so that decisions regarding timing of cessation of LMWH can be made. Usually stop for 48h prior to procedure i.e. miss 2 doses.</td>
</tr>
</tbody>
</table>

Patients on Fondaparinux

All patients should be discussed with Dr Clare Wykes, Consultant Haematologist, following their pre-operative assessment. In case of an emergency please contact on call Consultant Haematologist.
### Table 1: Dalteparin Doses for Heparin Bridge

<table>
<thead>
<tr>
<th>Weight</th>
<th>Cr Cl &gt; 30ml/min (200 units/kg)</th>
<th>CrCl &lt; 30ml/min (140 units/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 46kg</td>
<td>7500 units OD at 08.00h</td>
<td>5000 units OD at 08.00h</td>
</tr>
<tr>
<td>46 - 56kg</td>
<td>10000 units OD at 08.00h</td>
<td>7500 units OD at 08.00h</td>
</tr>
<tr>
<td>57 - 68kg</td>
<td>12500 units OD at 08.00h</td>
<td>10000 units OD at 08.00h</td>
</tr>
<tr>
<td>69 - 82kg</td>
<td>15000 units OD at 08.00h</td>
<td>10000 units OD at 08.00h</td>
</tr>
<tr>
<td>&gt;83kg</td>
<td>18000 units OD at 08.00h</td>
<td>12500 units OD at 08.00h</td>
</tr>
</tbody>
</table>

NB: Patients may require Anti-Xa monitoring*
Consider admitting for UFH after discussion with Renal physician

* Please discuss with Consultant Haematologist regarding Anti-Xa monitoring in patients with CrCl < 30ml/min using treatment dose LMWH for > 4 days

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### Patients with Renal Failure

#### Anti-Xa monitoring in Renal Failure
- Dalteparin levels can accumulate in renal failure over time. This is taken into account in the dosing table above.
- Treatment dose Dalteparin should not be given for 48 hours pre-procedure.
- For patients with CrCl <30ml/min, trough Anti-Xa levels should be checked after 4 doses of Dalteparin.
- Please liaise with Consultant Haematologist if Anti-Xa levels are being considered.

#### Renal Replacement Therapy
- All patients on RRT should be discussed with their Nephrologist following pre-operative assessment.
- Some patients may require UFH rather than LMWH.
Algorithm for Managing Antiplatelet agents peri-operatively

Decisions to be made on an individual patient basis balancing the peri-operative bleeding risk vs. thrombotic risk

Peri-operative bleeding risk*

- LOW
  - Dental
  - Minor
  - Orthopaedic or general
- INTERMEDIATE:
  - Major
  - Orthopaedic
  - Urological
  - Visceral
- HIGH:
  - Closed space surgery (e.g. intra-cranial, spinal canal or posterior eye chamber)

Increased risk of stent thrombosis associated with:

- PATIENT
  - Advanced age
  - Diabetes
  - Renal dysfunction
  - Poor ventricular function
- CORONARY ANATOMY
  - Multiple lesions
  - Long lesions
  - Bifurcation or Ostial lesions
  - Sub-optimal stent deployment

*Representative but not exhaustive list and patient specific factors also need to be taken into account in assessing bleeding risk

Aspirin Monotherapy

- Continue unless bleeding risk outweighs the risk of thrombotic complication (dependent upon indication)

Dual Anti-platelet therapy

- INDICATION
  - Bare metal stent: 4weeks
  - Drug eluting stent: 3-12 months (dependent upon stent)
  - ACS/NSTEMI/STEMI: 1year
- SURGERY
  - Elective: defer until completion
  - Emergency: continue
  - Urgent: stop ADP Antagonist (and continue aspirin where possible) on consideration of bleeding vs. thrombotic risk and discussion with Cardiologist

Duration to withhold antiplatelets prior to surgery

- Aspirin/Prasugrel: 7 days
- Clopidogrel/Ticagrelor: 5 days

Written by Consultant Cardiologist and Haematologist
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