A clinical guideline recommended for use

<table>
<thead>
<tr>
<th>In:</th>
<th>All clinical areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>By:</td>
<td>All medical and nursing staff</td>
</tr>
<tr>
<td>For:</td>
<td>Adult patients who require surgery or an invasive procedure and are taking warfarin</td>
</tr>
<tr>
<td>Key words:</td>
<td>Anticoagulation, Warfarin, Perioperative anticoagulation, Surgery, Invasive procedure, Venous Thromboembolism (VTE)</td>
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<td>Supported by:</td>
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<td>Approved by:</td>
<td>Clinical Guidelines Assessment Panel 22 February 2012 (CGAP)</td>
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<td>Reported as approved to the:</td>
<td>Clinical Effectiveness Committee Clinical Governance Committee</td>
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<td>Date of approval</td>
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<tr>
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<td>Dr Hamish Lyall/Dr Jennie Wimperis</td>
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</table>
Trust guideline for the management of adult patients who require elective surgery or an invasive procedure whilst they are anticoagulated with warfarin.

**Quick reference guideline**

**Dental Surgery:**
- See NPSA guidance

**Endoscopy**
- See British Society for Gastroenterology guideline

**Excluded from this Guideline:**
- Neurosurgery
- Ophthalmic surgery
- Plastic / dermatological surgery
- Biopsy of compressible site
- Joint aspiration/injection

**For other surgical procedures proceed according to thrombotic risk as below:**

**Higher Thrombotic Risk Group **
- VTE within 3 months
- Arterial embolism of cardiac origin within 1 month
- Mitral mechanical heart valve
- Recurrent VTE on life long warfarin
- Antiphospholipid syndrome

Discuss interruption of anticoagulation on an individual basis with Cardiology or Haematology consultant or clinician who initiated anticoagulant therapy.

- Follow high risk flow chart (Appendix A) if suitable
- Counsel patient regarding risks of interrupting of warfarin and document in notes

**Lower Thrombotic Risk Group  **
- VTE > 3 months previously
- Arterial embolism of cardiac origin > 1 month previously
- Atrial fibrillation
- Aortic mechanical valve (confirm risk with cardiologist)

- Follow low risk flow chart (Appendix B)
- Counsel patient regarding risks of interrupting warfarin and document discussion

**Anticoagulation for any other indication not included above should be discussed with the clinical team responsible for initiation of anticoagulation**
Trust guideline for the management of adult patients who require elective surgery or an invasive procedure whilst they are anticoagulated with warfarin.

Objective

This revised guideline applies to patients taking oral anticoagulation who require an invasive procedure. It aims to standardise their anticoagulant management across the Trust in line with national guidelines and in so doing to minimise morbidity and mortality from thrombosis or haemorrhage.

Rationale

Optimal perioperative management of patients taking oral anticoagulants must balance the risk of a thrombotic event associated with interruption of anticoagulation and the risk of haemorrhage associated with the procedure. This balance of risks will vary between individual patients. Large, well-designed trials do not exist to guide management of perioperative anticoagulation and hence there is considerable variation in practice between individual clinicians. This guideline incorporates the current published evidence to provide a simple, hospital-wide protocol for the management of perioperative anticoagulation. It will be applicable to the majority of chronically anticoagulated patients undergoing elective surgery at NNUH.

Broad recommendations

Exclusions

This guideline does not apply to neurosurgical patients where the risk from haemorrhage is much greater. Nor does it apply to patients undergoing minor procedures such as minor dermatological procedures, joint injection or biopsy of an easily compressible site where the procedure can usually be performed without interruption of anticoagulation. Ophthalmology and plastic surgery patients are excluded from this guideline and should be discussed with the consultant treating the patient.

Dental Surgery

The national patient safety agency (NPSA) has published advice for dentists performing procedures on patients taking warfarin. Procedures may be carried out if the INR < 4.0. There are important technical considerations as well as postoperative analgesia and antibiotic prescribing considerations for this patient group. The NPSA guidance (see link) should be followed.

Endoscopy

The British Society for Gastroenterology has recently produced national guidelines for the management of anticoagulant and antiplatelet therapy in patients undergoing
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endoscopic procedures. This guidance can be accessed at www.bsg.org.uk/pdf_word_docs/anticoagulant_08.pdf

Thrombotic Risk

1. Venous Thromboembolism (VTE)

Interruption of anticoagulation during the first month following VTE is associated with an extremely high rate of recurrence. Assuming 4 or 5 days of subtherapeutic anticoagulation peri-surgery this risk is estimated to be in the region of 70 percent\(^1\). This risk falls to around 13 percent during months 2 and 3 post VTE\(^1\). If at all possible surgery should be avoided during this period and if unavoidable heparin should be used to bridge the period of suboptimal anticoagulation and management discussed with a consultant haematologist. Patients within one month of VTE should be considered for an IVC filter to cover the perioperative period. After the third month the risk of a further thrombotic event is much lower. Patients on long term warfarin for recurrent VTE should also be considered high risk.

2. Atrial fibrillation and arterial embolism

The risk of a thrombotic event during perioperative interruption of anticoagulation in patients with atrial fibrillation is less than 1 percent\(^1\). However, it is likely to be much higher during the first month after an arterial embolism of cardiac origin and these patients should be considered to be at high thrombotic risk and management discussed with a consultant haematologist.

3. Mechanical Heart Valves

The thrombotic risk to patients with mechanical heart valves is heavily influenced by the site and type of valve\(^2\). Small observational studies demonstrate that mechanical aortic valves are associated with a negligible risk of thrombotic events during perioperative interruption of anticoagulation even in the absence of bridging heparin (no thrombotic events from 31 and 18 patients whose anticoagulation was simply stopped perioperatively)\(^2\). However, the risk is much higher for mechanical mitral valves (2 of 10 patients who did not receive bridging heparin and 2 of 19 patients poorly anticoagulated patients)\(^2\). These studies looked mainly at older style valves and more modern valves may be associated with a much lower risk of thrombotic events\(^2\). Furthermore poor cardiac function is associated with a higher risk of valve-related thrombotic events. As a general rule mechanical mitral valves should be considered a high thrombotic risk and receive bridging heparin while aortic valves can be considered lower risk. Because of the individual nature of thrombotic risk perioperative management of patients with prosthetic cardiac valves should be discussed with the patient’s cardiologist prior to surgery.

4. Thrombophilias
Trust guideline for the management of adult patients who require elective surgery or an invasive procedure whilst they are anticoagulated with warfarin.

Patients on warfarin with a high risk thrombophilia (antiphospholipid syndrome, antithrombin deficiency) should be discussed with a haematologist prior to surgery.

5. Other Indications

Although the indications above cover the majority of patients taking warfarin a small number of patients may be on warfarin for other reasons. The thrombotic risk to such patients is highly individualised and should therefore be discussed on an individual basis with the clinician who initiated anticoagulation.

Risk of Haemorrhage and checking INR

Although there are no prospective trials the consensus of opinion is that the risk of bleeding is high in any procedure that involves major surgery, perforation of a body cavity or biopsy of a non-compressible site. Current UK guidelines suggest that for major surgery warfarin is stopped 3 – 4 days pre-operatively aiming for an INR of <1.5 (3). The American College of Chest Physicians (ACCP) recommends withholding warfarin for 5 days (6). At NNUH most surgeons have withheld 5 doses of warfarin. This guideline therefore recommends withholding 5 doses of warfarin. If the INR is > 1.5 at the time of surgery the balance of haemorrhage vs. urgency of surgery must be considered and the decision to proceed should be at the discretion of the operating surgeon. Vitamin K may be appropriate to reverse anticoagulation. It needs to be given at least 12 hours prior to the procedure to take effect. Haematology advice should be sought in the first instance.

The NNUH surgical consensus is that minor surgery requires an INR of < 2.0 and this has been incorporated in to this guideline.

The INR can be checked immediately prior to the procedure if the procedure is being performed in an area where ‘coagucheck’ point of care testing device is in use. If a laboratory INR is being used this may be done on Day -1 or the day of surgery. At least 4 hours turnaround time must be allowed for laboratory processing of an INR.

Heparin bridging therapy

High thrombotic risk

The risk of serious haemorrhage for patients therapeutically anticoagulated with unfractionated heparin perioperatively is estimated to be in the region of 3 percent (1). The risk will be dependant on the procedure performed. The risk can be reduced by delaying the start of re-anticoagulation after the procedure and reducing the intensity of anticoagulation after the procedure. The risk of haemorrhage needs to be balanced against the thrombotic risk. For the majority of chronically anticoagulated patients this haemorrhagic risk will exceed any thrombotic risk posed by interruption
Trust guideline for the management of adult patients who require elective surgery or an invasive procedure whilst they are anticoagulated with warfarin.

of anticoagulation. For patients who are deemed at high thrombotic risk, bridging therapy with therapeutic heparin should be discussed on an individual basis with a haematology or cardiology consultant as appropriate. Where possible, subcutaneous, low molecular weight heparin (LMWH) is preferred to intravenous, unfractionated heparin (UFH). LMWH gives more consistent anticoagulation, does not require monitoring and does not require intravenous access. Numerous studies documenting its successful and safe use in perioperative bridging therapy have been published (6). Patients may be able to self-administer LMWH at home perioperatively as an alternative to being admitted. LMWH should not be used in patients with a glomerular filtration rate (GFR) < 30ml/min. The template in appendix A should be followed.

NB. Specific care must be taken if regional/epidural anaesthesia is planned. The case must be discussed with the anaesthetist performing the anaesthetic and the trust guideline ‘CA2031 Regional Anaesthesia Venous Thromboprophylaxis’ should be consulted.

Low thrombotic risk

Patients in whom anticoagulation has been stopped and who have a low thrombotic risk should receive prophylactic dose LMWH whilst an inpatient. This should continue until INR re-enters the therapeutic range. The template in appendix B should be followed.

NB. Specific care must be taken if regional/epidural anaesthesia is planned. The case must be discussed with the anaesthetist performing the anaesthetic and the trust guideline ‘CA2031 Regional Anaesthesia Venous Thromboprophylaxis’ should be consulted.

Antiplatelet Agents

A small number of patients are treated with both oral anticoagulation and antiplatelet agents. In these patients the risk of bleeding should be assumed to be greater than in those treated with oral anticoagulation alone. Cardiology advice must be sought for these patients prior to stopping drugs.

Clinical audit standards

1. All preoperative patients taking oral anticoagulants should have the indication for anticoagulation documented in case notes and an assessment made as to whether they are at high or low thrombotic risk.
2. Patients at high thrombotic risk should have their perioperative management discussed with the haematology or cardiology department as appropriate.
3. All orally anticoagulated patients should cease warfarin 5 days prior to planned surgery.
Trust guideline for the management of adult patients who require elective surgery or an invasive procedure whilst they are anticoagulated with warfarin.

4. The INR should be measured within 24 hours of surgery and should be < 1.5 for major surgery and < 2.0 for minor surgery.
5. Any audit should monitor rates of haemorrhagic or thrombotic complications and the number of surgical procedures cancelled because of high INR.

Summary of development and consultation process undertaken before registration and dissemination

This guideline has been agreed by all Consultants in Cardiology, Haematology and the NNUH thrombosis and thromboprophylaxis committee. This version has been endorsed by the Clinical Guidelines Assessment Panel.

Distribution list/ dissemination method

This guideline will be available on the trust intranet.

References/ source documents


**Appendix A**

**High Thrombotic Risk Patients**

*IF REGIONAL/EPIDURAL ANAESTHESIA IS BEING USED DISCUSS WITH ANAESTHETIST AND CONSULT TRUST GUIDELINE CA2031 ‘REGIONAL ANAESTHESIA AND THROMBOPROPHYLAXIS’*

<table>
<thead>
<tr>
<th></th>
<th>Day -5</th>
<th>Day -4</th>
<th>Day -3</th>
<th>Day -2</th>
<th>Day -1</th>
<th>Day 0 Surgery</th>
<th>Day +1</th>
<th>Day +2</th>
<th>Day +3</th>
<th>Day +4</th>
<th>Day +5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check INR</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Dalteparin 200 units/kg 18.00 hrs</td>
<td>OMIT</td>
<td>OMIT</td>
<td>OMIT</td>
<td>GIVE</td>
<td>OMIT</td>
<td>OMIT</td>
<td>GIVE</td>
<td>(After assessing bleeding risk)**</td>
<td>GIVE daily until INR in therapeutic range** then stop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warfarin 18.00 hrs (REFER PATIENT TO ANTICOAGULATION TEAM FOR DOSING)</td>
<td>GIVE USUAL DOSE</td>
<td>OMIT</td>
<td>OMIT</td>
<td>OMIT</td>
<td>OMIT</td>
<td>OMIT</td>
<td>Give patients USUAL daily dose* if : 1. Not likely to return to theatre 2. Patient is not actively bleeding/high risk of bleeding 3. Epidural catheter not present Otherwise OMIT until safe to restart</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dalteparin 5000 units s/c 18.00 hrs</td>
<td>OMIT</td>
<td>OMIT</td>
<td>OMIT</td>
<td>OMIT</td>
<td>GIVE</td>
<td>GIVE</td>
<td>(Give daily if warfarin and dalteparin 200 Units/kg is being withheld)</td>
<td></td>
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</tbody>
</table>

Mechanical thromboprophylaxis measures (stockings, pneumatic compression) should be used as per departmental thromboprophylaxis policy during hospital admission.

**INR should be <1.5 for major surgery or <2.0 for minor surgery to proceed.**

*Give patient the dose of warfarin they were on prior to admission (DO NOT give loading dose).

**If actively bleeding or needs to return to theatre imminently OMIT dose until bleeding risk falls.

*If the procedure has a significant postoperative bleeding risk the therapeutic dalteparin dose (200 Units/kg) should be given in 2 divided doses (18.00 & 0600) starting no earlier than 18.00 on Day +1 (If epidural catheter present once daily dosing is preferable). Refer all patients to anticoagulation nurses for warfarin dosing once warfarin restarted (bleep 0799)
Appendix B

Low Thrombotic Risk Patients

IF REGIONAL/EPIDURAL ANAESTHESIA IS BEING USED DISCUSS WITH ANAESTHETIST AND CONSULT TRUST GUIDELINE CA2031 ‘REGIONAL ANAESTHESIA AND THROMBOPROPHYLAXIS’

<table>
<thead>
<tr>
<th>Day</th>
<th>Check INR</th>
<th>Dalteparin</th>
<th>Warfarin</th>
</tr>
</thead>
<tbody>
<tr>
<td>-5</td>
<td></td>
<td>OMIT</td>
<td>GIVE USUAL DOSE</td>
</tr>
<tr>
<td>-4</td>
<td>✓</td>
<td>OMIT</td>
<td>OMIT</td>
</tr>
<tr>
<td>-3</td>
<td>✓</td>
<td>OMIT</td>
<td>OMIT</td>
</tr>
<tr>
<td>-2</td>
<td>✓</td>
<td>GIVE (if patient in hospital)</td>
<td>OMIT</td>
</tr>
<tr>
<td>-1</td>
<td>✓</td>
<td>GIVE (if patient in hospital)</td>
<td>OMIT</td>
</tr>
<tr>
<td>Surgery</td>
<td>✓</td>
<td>GIVE (if patient in hospital)</td>
<td>OMIT</td>
</tr>
</tbody>
</table>
| +1   | ✓         | GIVE (if patient in hospital) | GIVE patients USUAL daily dose* if:
| +2   | ✓         | GIVE (if patient in hospital) | 1. No return to theatre likely
| +3   | ✓         | GIVE (if patient in hospital) | 2. Patient is not actively bleeding
| +4   | ✓         | GIVE (if patient in hospital) | 3. Epidural catheter not present
| +5   | ✓         | GIVE (if patient in hospital) | Otherwise OMIT until safe to restart

Mechanical thromboprophylaxis measures (stockings, pneumatic compression) should be used as per departmental thromboprophylaxis policy during hospital admission

INR should be <1.5 for major surgery or <2.0 for minor surgery to proceed.

* Give patients the dose of warfarin they were on prior to admission (DO NOT give loading dose).
** If actively bleeding or needs to return to theatre imminently OMIT dose until bleeding risk falls.
Dalteparin can be stopped postoperatively when INR therapeutic.
Refer all patients to anticoagulation nurses for warfarin dosing once warfarin restarted (bleep 0799)
Discharge does not need to be delayed for anticoagulation – discuss with anticoagulation nurses.