# Guidelines for the Management of Warfarin During Invasive Procedures (Adult Surgical Patients (non-pregnant))

These guidelines provide recommendations for patients on long-term warfarin (or other vitamin K antagonists) who require an **elective** procedure for which an INR less than 1.5 is required. Patients on these oral anticoagulants requiring **emergency** procedures may require rapid anticoagulant reversal and should be discussed with a clinical haematologist on a case-by case basis.

Certain procedures **may** be performed without interruption of anticoagulation (with INR less than 3.0), including: minor dental, ophthalmological and dermatological surgery; joint injections; diagnostic angiography or pacemaker insertion; and low risk endoscopic procedures (e.g. diagnostic procedure +/- biopsy, biliary or pancreatic stenting). Refer to the relevant specialist or departmental guidelines.

Management of perioperative anticoagulation varies according to the balance between **thrombosis risk** (baseline risk plus additional thrombotic risk from the procedure) and **bleeding risk** (baseline risk of patient on anticoagulant plus additional risk from the procedure or other factors, including spinal/epidural anaesthesia).

Reintroduction of prophylactic or therapeutic anticoagulation following an invasive procedure must be based on the assessment of surgical site bleeding risk: a period **without any anticoagulation** may be required to avoid excessive or critical site bleeding. Procedures with a very high operative bleeding risk or involving use of spinal/epidural anaesthesia may follow these protocols but post-procedural anticoagulation may need to be individualised and should be discussed between the responsible surgeon and haematologist.

It is important that the risks of the procedure are discussed with the patient and a plan agreed upon. A senior member of the team is best placed to evaluate the risks, discuss them and formulate a plan. The templates in this document provide a way for the outcomes of these discussions to be clearly documented for all members of the team involved in the patient's care.

Procedures under spinal or epidural anaesthesia require specific consideration: refer to GHNHSFT Policy A2165 ('Anticoagulants, Antiplatelets and spinal/epidural Anaesthesia). Neuraxial procedures including catheter insertion should not be performed if INR greater than or equal to 1.5; within 12 hours of prophylactic dose low molecular weight heparin (LMWH); or within 24 hours of treatment dose LMWH. Doses of LMWH can be administered a minimum of 4 hours after catheter removal (in the presence of adequate haemostasis).

Perform a patient risk assessment using Table 1 then select from the **LOWER (Protocol A) or HIGHER (Protocol B) risk protocol**. These templates may require modification for patients considered to have a very high bleeding risk, patients with renal impairment or to accommodate neuraxial procedures as recommended above.

Prescribing information for LMWH is contained in Appendix 1 and Appendix 2.

Patients apart from the below (Table 1) can generally be managed by stopping warfarin 5 days before elective surgery, as appropriate. These LOWER thrombotic risk patients (Protocol A), should then be risk assessed and provided with prophylactic LWMH post-operatively as outlined in Appendix 1.

**Table 1** When to consider bridging with treatment dose LMWH in patients who stop warfarin

| | **Consider bridging with full treatment dose LMWH i.e. Protocol B (HIGHER thrombotic risk), for:** |
|---|---|
| **VTE** | Patients with a VTE within previous 3 months<br><br>Very high-risk patients such as patients with a previous VTE whilst on therapeutic anticoagulation who now have a target INR of 3.5 |
| **AF** | Patients with a previous stroke/TIA in the last 3 months<br><br>Patients with a previous stroke/TIA and three of more of the following risk factors<br>• Congestive cardiac failure<br>• Hypertension (either BP greater than 140/90 mmHg or on antihypertensive treatment)<br>• Age over 75 years<br>• Diabetes mellitus |
| **MHV** | All Mechanical Heart Valve patients except those with a bileaflet aortic valve and no other risk factors e.g. previous stroke/TIA, atrial fibrillation or reduced left ventricular ejection fraction |

# Anticoagulant Bridging Protocol for Invasive Procedures and Surgery

## Protocol A: LOWER THROMBOTIC RISK

Name:

Date of birth:

Hospital number:

Procedure: Date of Procedure:

Surgeon: Indication for anticoagulation:

Anaesthetist: Target INR:

**Patient weight** **kg**

**Creatinine Clearance** **mL/min** (see Appendix 1 for dosing information)

| | | Date | Management (See Appendix 1 for dosing information and delete as appropriate) |
|---|---|---|---|
| **Day -5** | day | dd/mm/yy | **stop warfarin** (last dose on Day -6). No pre-operative anticoagulation required. |
| **Day -4** | day | dd/mm/yy | **no warfarin** |
| **Day -3** | day | dd/mm/yy | **no warfarin** |
| **Day -2** | day | dd/mm/yy | **no warfarin** |
| **Day -1** | day | dd/mm/yy | **no warfarin**. If feasible, check INR and consider Vitamin K 1mg orally if INR greater or equal to 1.5 |
| **Op day** | day | dd/mm/yy | **no warfarin**. Check INR less than 1.5 on admission<br>Providing haemostasis is secure, and at the discretion of the responsible surgeon, start<br>**prophylactic dose .....mg** Low Molecular Weight Heparin (LMWH) subcutaneously once daily, 6-12 hours post-operatively |
| **Day +1** | day | dd/mm/yy | providing haemostasis is secure<br>give **prophylactic dose .....mg ONCE daily** LMWH subcutaneously until INR greater or equal to 2 for two consecutive days **and** restart warfarin at **usual maintenance dose** (no loading doses) **at 6pm** |

- for procedures under spinal or epidural anaesthesia refer to GHNHSFT Policy A2165
- check platelet count every 2 days after starting LMWH to exclude heparin induced thrombocytopenia
- ensure anticoagulation follow up arranged on discharge from hospital

Risks of procedure discussed with patient and above management plan agreed

| | | | |
|---|---|---|---|
| **LAST DOSE OF WARFARIN ON –**<br>---------- | Authorising Senior Clinician | (sign) | (print) |
| | Position | | |
| | Date | | |

# Anticoagulant Bridging Protocol for Invasive Procedures and Surgery

## Protocol B: HIGHER THROMBOTIC RISK (As per risk factors in Table 1)

Name:

Date of birth:
Hospital number:
Procedure: Date of Procedure:

Surgeon: Indication for Anticoagulation:
Anaesthetist: Target INR:
**Patient weight** **kg**
**Creatinine Clearance** **mL/min** (creatinine clearance <30ml/min: refer to Appendix 1 and 2)

| | | Date | **Management** (See Appendix 1 and 2 and delete as appropriate) |
|---|---|---|---|
| **Day -5** | day | dd/mm/yy | **stop warfarin** (last dose on Day -6) |
| **Day -4** | day | dd/mm/yy | **no warfarin** |
| **Day -3** | day | dd/mm/yy | **no warfarin**<br>give **therapeutic dose .....mg ONCE a day at 8am** Low Molecular Weight (LMWH) subcutaneously (SC) |
| **Day -2** | day | dd/mm/yy | **no warfarin**<br>give **therapeutic dose .....mg ONCE a day at 8am** LMWH SC |
| **Day -1** | day | dd/mm/yy | **no warfarin**<br>give **therapeutic dose .....mg ONCE a day at 8am** LMWH SC<br>(Reduce to 1mg/kg if high bleeding risk surgery or planned spinal/epidural anaesthesia)<br>The last dose of therapeutic LMWH should be at least 24 hours before surgery. |
| **Op day** | day | dd/mm/yy | **no warfarin**. Check INR less than 1.5 pre-operatively<br>Providing haemostasis is secure, and at the discretion of the responsible surgeon, restart<br>**prophylactic dose .....mg** LMWH subcutaneously **ONCE** daily 6-12 hours post-operatively |
| **Day +1** | day | dd/mm/yy | providing haemostasis is secure, if **high bleeding risk or spinal/epidural anaesthesia**<br>**continue prophylactic dose .....mg ONCE daily** LMWH OR if non-high-risk bleeding give **therapeutic** dose LMWH **and** restart **warfarin at usual maintenance dose at 6pm** (no loading doses) |
| **Day +2** | day | dd/mm/yy | give **therapeutic** dose LMWH until INR greater or equal to 2 for two consecutive days. If any concern over bleeding, continue prophylactic dose LMWH until bleeding concern resolved, then increase to therapeutic dose as described. |

- for procedures under spinal or epidural anaesthesia refer to GHNHSFT Policy A2165
- check platelet count every 2 days after starting LMWH to exclude heparin induced thrombocytopenia
- ensure anticoagulation follow up arranged on discharge from hospital

Risks of procedure discussed with patient and above management plan agreed

| | | | |
|---|---|---|---|
| **LAST DOSE OF WARFARIN ON –**<br>---------- | Authorising Senior Clinician | (sign) | (print) |
| | Position | | |
| | Date | | |

**Appendix 1- Dosing Guidelines for PROPHYLACTIC dosing** (in Adult Surgical Patients (non-pregnant))

Body weight, renal function (calculated as creatinine clearance [CrCl] using Cockcroft-Gault equation – eGFR should not be used as it is not equivalent) and individual contraindications/bleeding risk factors should be checked before prescribing.

A CrCl calculator is available via: Creatinine Clearance (Cockcroft-Gault Equation) (mdcalc.com)†

**Patients with creatinine clearance over 30ml/min (via subcutaneous injection)**

| | |
|---|---|
| Weight less than 50kg | Enoxaparin 20mg ONCE daily |
| Weight greater than or equal to 50kg | Enoxaparin 40mg ONCE daily |

**Patients with creatinine clearance less than 30ml/min, including dialysis* (via subcutaneous injection)**

| | |
|---|---|
| All patients | Enoxaparin 20mg ONCE daily |

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

* Following EU harmonisation of the Summary of Product Characteristics in 2017, enoxaparin is no longer licensed for use if CrCl is <15ml/min. However, the local nephrologists consider this acceptable practice, given the difficulties with alternative approaches and the extensive local experience with enoxaparin in this group of patients.

**Appendix 2- Dosing Guidelines for THERAPEUTIC dosing** (in Adult Surgical Patients (non-pregnant))

For therapeutic dosing, the dose of enoxaparin is based on body weight. Patients must therefore be weighed to ensure an accurate dose of enoxaparin is prescribed, and the weight documented. Renal function must also be checked prior to prescribing (calculated as creatinine clearance [CrCl] using Cockcroft-Gault equation† – eGFR should not be used as it is not equivalent). Patients with CrCl less than 30ml/min should receive a reduced dose of enoxaparin – see below section on renal impairment.

Inhixa® (enoxaparin biosimilar) is supplied as pre-filled syringes of 20mg, 40mg, 60mg, 80mg, 100mg, 120mg and 150mg. Standard doses are rounded to the nearest syringe size.

In this peri-operative cohort of patients the standard dosing of 1.5mg/kg OD SC (CrCl >30ml/min) should be used. As per Protocol B consideration should be given to reducing to 1mg/kg in high bleed risk procedures.

| Standard dosing of Inhixa® for treatment of VTE in CrCl >30ml/min: 1.5mg/kg OD SC | |
|---|---|
| 40-47kg | 60mg OD |
| 48-59kg | 80mg OD |
| 60-73kg | 100mg OD |
| 74-88kg | 120mg OD |
| 89-109kg | 150mg OD |
| 110-125kg | 180mg OD (100mg + 80mg) |
| 126-150kg | 1.5mg/kg split dose (dose divided BD and rounded to nearest syringe size. This may lead to asymmetric dosing) |
| Over 150kg | Discuss with haematology |

**Renal Impairment**

For patients with severe renal impairment (**CrCl less than 30ml/min**) the dose of enoxaparin for the treatment of VTE is **1mg/kg once daily SC*.** The dose should be rounded to the nearest 10mg for ease of administration, as follows:

| Weight range | Renal dose | Additional Administration Information | |
|---|---|---|---|
| 45-54kg | 50mg OD | 0.5ml from 60mg syringe | |
| 55-64kg | 60mg OD | - | |
| 65-74kg | 70mg OD | 0.7ml from 80mg syringe | |
| 75-84kg | 80mg OD | - | |
| 85-94kg | 90mg OD | 0.9ml from 100mg syringe | |
| 95-104kg | 100mg OD | - | |
| 105-114kg | 110mg OD | 60mg | + 0.5ml (50mg) from 60mg syringe |
| 115-124kg | 120mg OD | - | |
| 125-134kg | 130mg OD | 80mg | + 0.5ml (50mg) from 60mg syringe |
| 135-144kg | 140mg OD | 80mg | + 60mg |
| 145-154kg | 150mg OD | - | |

Doses greater than 150mg will also require multiple syringes to be used. The dose is not capped.
When using partial syringes, be aware that the 60mg, 80mg and 100mg syringes are 100mg/ml strength, but the 120mg and 150mg syringes are a higher 150mg/ml strength.

References

Warfarin. September 2019. UK Clinical Pharmacy Association Handbook of Perioperative Medicines. Accessed: https://periop-handbook.ukclinicalpharmacy.org/drug/warfarin/

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Summary of Product Characteristics for Inhixa®. Last updated on eMC 10th March 2022. Electronic Medicines Compendium Inhixa 4,000 IU (40 mg)/0.4 mL solution for injection - Summary of Product Characteristics (SmPC) - (emc)

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