Guidelines for the Management of Warfarin During Invasive Procedures

These guidelines provide recommendations for patients on long-term warfarin (or other vitamin K antagonists) who require an **elective** procedure for which an INR <1.5 is preferred. 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 <3.0) including minor dental, ophthalmological and dermatological surgery, diagnostic angiography and invasive cardiology procedures, and diagnostic endoscopies (including ultrasound), 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).

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 may follow these protocols but post-procedural anticoagulation may need to be individualized 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 Reference A395 "Anticoagulation and Spinal/Epidural Anaesthesia". Neuraxial procedures including catheter insertion or removal should not be performed if INR ≥1.5, within 12 hours of prophylactic dose dalteparin or with 24 hours of treatment dose dalteparin (>5,000iu).

Perform a patient risk assessment using table 1 then select from the following four template protocols. Protocol D is intended for patients receiving high intensity anticoagulation (usually with a target INR 3.5). 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 low molecular weight heparin is contained in the Appendix on the final page of this document.

Table 1: Thrombotic Risk Groups

	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 (**Use Template Protocol A***)	$CHADS_2$ score ≤2 + no prior stroke or TIA
Mechanical Heart Valves	Any mechanical valve + CVA or TIA within 6 months any mechanical *mitral* valve caged ball or tilting disc *aortic* valve	Bileaflet aortic valve + any additional stroke risk factor: stroke risk factors chronic AF LV dysfunction hypertension age >75 diabetes prior stoke or TIA	Bileaflet aortic valve and no other risk factors for stroke
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 (target INR 3.5) (protocol D)	VTE within 3-12 months VTE on long-term anticoagulant therapy (target INR 2.5) cancer therapy within 6 months or active disease (patients usually on LMWH)	(patients with previous VTE not on anticoagulation should follow the thromboprophylaxis protocol)
	Template Protocol C or D	**Template Protocol B**	**Template Protocol A**

*Newly published data suggest this group have low peri-operative thrombotic risk and should be managed using Protocol A. Other indications in 'Moderate Thrombotic Risk' should use Template Protocol B.

Anticoagulant Bridging Protocol for Invasive Procedures and Surgery

Protocol A: LOW THROMBOTIC RISK

Name:	
Date of birth:	
Hospital number:	
Procedure:	Date of Procedure:
Surgeon:	Anaesthetist:
Indication for Anticoagulation:	Target INR:

Patient Weight kg

Current Creatinine umol/L

		Date	Management
Day -4	day	dd/mm/yy	stop warfarin (last dose given Day -5) no pre-operative anticoagulation required
Day -1	day	dd/mm/yy	if feasible, check INR - and consider Vitamin K 1mg orally if INR ≥ 1.5
Op day	day	dd/mm/yy	check INR on admission providing haemostasis is secure, and at the discretion of the responsible surgeon, start dalteparin **5,000iu** subcutaneously once daily 6-8 hours post-operatively
Day +1	day	dd/mm/yy	providing haemostasis is secure restart warfarin at **usual maintenance dose** (no loading doses) **and** give dalteparin **5,000iu** subcutaneously daily (6PM) until INR ≥2.0 for two consecutive days

- for procedures under spinal or epidural anaesthesia refer to GHNHSFT Policy Reference A395 "Anticoagulation and Spinal/Epidural Anaesthesia"
- check platelet count every 2 days **after starting dalteparin** 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

Authorising Senior Clinician	(sign)	(print)
Position		
Date		

"therapeutic dose" dalteparin =200iu/kg: **maximum dose =18,000iu/day**

Anticoagulant Bridging Protocol for Invasive Procedures and Surgery
Protocol B: MODERATE THROMBOTIC RISK

Name:	
Date of birth:	
Hospital number:	
Procedure:	Date of Procedure:
Surgeon:	Anaesthetist:
Indication for Anticoagulation:	Target INR

Patient Weight kg

Current Creatinine umol/L (creatinine clearance <30ml/min: refer to Prescribing Appendix)

		Date	Management
Day -4	day	dd/mm/yy	stop warfarin (last dose given on Day-5)
Day -2	day	dd/mm/yy	start dalteparin **5,000iu** subcutaneously daily (6PM)
Day -1	day	dd/mm/yy	if feasible, check INR (if not - give dalteparin **5,000iu** subcutaneously (6PM)) if INR ≥1.5 give dalteparin **5,000iu** subcutaneously (6PM) **and** vitamin K 1mg orally if INR <1.5 give dalteparin **5,000iu** subcutaneously (6PM)
Op day	day	dd/mm/yy	check INR providing haemostasis is secure, and at the discretion of the responsible surgeon, restart dalteparin **5,000iu** subcutaneously daily 6-8 hours post-operatively
Day +1	day	dd/mm/yy	providing haemostasis is secure restart warfarin at **usual maintenance dose** (no loading doses) **and** give therapeutic dose dalteparin as split dose 100iu/kg (6AM) + 100iu/kg (6PM) use appendix to calculate doses more easily
Day +2	day	dd/mm/yy	give dalteparin 200iu/kg subcutaneously daily (6PM) until INR ≥2.0 for two consecutive days use appendix to calculate doses more easily

• if any concern over bleeding, continue dalteparin 5000iu subcutaneously daily until bleeding concern resolved then increase dalteparin as above
• for procedures under spinal or epidural anaesthesia refer to GHNHSFT Policy Reference A0173 "Anticoagulation and Regional Anaesthesia"
• check platelet count every 2 days **after starting dalteparin** 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

Authorising Senior Clinician	(sign)	(print)
Position		
Date		

"therapeutic dose" dalteparin =200iu/kg: **maximum dose =18,000iu/day**

Anticoagulant Bridging Protocol for Invasive Procedures and Surgery
Protocol C: HIGH THROMBOTIC RISK (STANDARD INTENSITY ANTICOAGULATION)

Name:	
Date of birth:	
Hospital number:	
Procedure:	Date of Procedure:
Surgeon:	Anaesthetist:
Indication for Anticoagulation:	Target INR:

Patient Weight kg

Current Creatinine umol/L (creatinine clearance <30ml/min: refer to Prescribing Appendix)

		Date	Management
Day -4	day	dd/mm/yy	stop warfarin (last dose given on Day -5)
Day -2	day	dd/mm/yy	check INR if INR <2.0 give dalteparin 200iu/kg subcutaneously (6PM) – use table in appendix for dosing if INR ≥2.0 withhold dalteparin and give vitamin K 1mg orally
Day -1	day	dd/mm/yy	check INR on admission if INR ≥1.5 give dalteparin **5,000iu** subcutaneously (6PM) **and** vitamin K 1mg orally if INR <1.5 give dalteparin **5,000iu** subcutaneously (6PM)
Op day	day	dd/mm/yy	check INR providing haemostasis is secure, and at the discretion of the responsible surgeon, restart dalteparin **5,000iu** subcutaneously daily 6-8 hours post-operatively
Day +1	day	dd/mm/yy	providing haemostasis is secure restart warfarin at **usual maintenance dose** (no loading doses) **and** give therapeutic dose dalteparin as split dose 100iu/kg (6AM) + 100iu/kg (6PM)
Day +2	day	dd/mm/yy	give dalteparin 200iu/kg subcutaneously daily (6PM) until INR ≥2.0 for two consecutive days use appendix to calculate doses more easily

• if any concern over bleeding, continue dalteparin 5000iu subcutaneously daily until bleeding concern resolved then increase dalteparin as above
• for procedures under spinal or epidural anaesthesia refer to GHNHSFT Policy Reference A395 "Anticoagulation and Spinal/Epidural Anaesthesia"
• check platelet count every 2 days **after starting dalteparin** 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

Authorising Senior Clinician	(sign)	(print)
Position		
Date		

"therapeutic dose" dalteparin =200iu/kg: **maximum dose =18,000iu/day**

Anticoagulant Bridging Protocol for Invasive Procedures and Surgery
Protocol D: HIGH THROMBOTIC RISK (HIGH INTENSITY ANTICOAGULATION)

Name:

Date of birth:

Hospital number:

Procedure: Date of Procedure:

Surgeon: Anaesthetist:

Indication for Anticoagulation: Target INR:

Patient Weight kg

Current Creatinine umol/L (creatinine clearance <30ml/min: refer to Prescribing Appendix)

		Date	Management
Day -5	day	dd/mm/yy	stop warfarin (last dose on Day -6)
Day -3	day	dd/mm/yy	check INR if INR <2.5 give dalteparin 200iu/kg subcutaneously (6PM) – use table in appendix if INR ≥2.5 withhold dalteparin and repeat INR next day
Day -2	day	dd/mm/yy	check INR if INR <1.5 give dalteparin 200iu/kg subcutaneously (6PM) – use table in appendix if INR 1.5 -2.4 give dalteparin 200iu/kg subcutaneously (6PM) **and** vitamin K 1mg orally if INR ≥2.5 withhold dalteparin and give vitamin K 1mg orally
Day -1	day	dd/mm/yy	check INR on admission if INR ≥1.5 give dalteparin **5,000iu** subcutaneously (6PM) **and** vitamin K 1mg orally if INR <1.5 give dalteparin **5,000iu** subcutaneously (6PM)
Op day	day	dd/mm/yy	providing haemostasis is secure, and at the discretion of the responsible surgeon, restart dalteparin **5,000iu** subcutaneously daily 6-8 hours post-operatively
Day +1	day	dd/mm/yy	providing haemostasis is secure restart warfarin at **usual maintenance dose** (no loading doses) **and** give therapeutic dose dalteparin as split dose 100iu/kg (6AM) + 100iu/kg (6PM)
Day +2	day	dd/mm/yy	give dalteparin 200iu/kg subcutaneously daily (6PM) until INR ≥2.5 for two consecutive days

• if any concern over bleeding, continue dalteparin 5000iu subcutaneously daily until bleeding concern resolved then increase dalteparin as above
• for procedures under spinal or epidural anaesthesia refer to GHNHSFT Policy Reference A0173 "Anticoagulation and Regional Anaesthesia"
• check platelet count every 2 days **after starting dalteparin** 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

Authorising Senior Clinician	(sign)	(print)
Position		
Date		

"therapeutic dose" dalteparin =200iu/kg: **maximum dose =18,000iu/day**

Appendix: Prescribing Information

The protocols may require modification for patients considered to have a very high bleeding risk, patients with renal impairment or to accommodate neuraxial procedures.
Dalteparin should be administered subcutaneously according to the following weight ranges (**maximum 18,000iu/day**)

Weight (kg)	**Therapeutic dalteparin dose (approximately 200iu/kg OD)**	**Therapeutic dalteparin SPLIT dose (approximately 100iu/kg BD)**
<46	7,500iu OD	5,000iu at 6AM and 2,500iu at 6PM
46-56	10,000iu OD	5,000iu BD
57-68	12,500iu OD	7,500iu at 6AM and 5,000iu at 6PM
69-82	15,000iu OD	7,500iu BD
≥83	18,000iu OD	10,000iu at 6AM and 7,500iu at 6PM

Renal Impairment

For **prophylactic anticoagulation**-
Age or renal impairment should not be a basis to reduce the dalteparin dose for thromboprophylaxis.
Dalteparin 5,000iu subcutaneously once daily is suitable for patients with impaired renal function.

For **therapeutic anticoagulation**-
If creatinine clearance >30ml/min, use therapeutic dalteparin dose according to protocol.
If **creatinine clearance <30ml/min**, use enoxaparin (Clexane®) 1mg/kg subcutaneously once daily.

References

Martin J, editor. British National Formulary 62. London: BMJ Publishing Group Ltd, RPS Publishing, 2011.

Summary of Product Characteristics for Fragmin® Treatment of VTE Electronic medicines compendium. Date of revision of the text June 2011 http://emc.medicines.org.uk/

Gloucestershire Hospitals NHS Foundation Trust. Guideline for prophylaxis and treatment of venous thromboembolism in patients with renal impairment. March 2010.

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