Guidelines on the Use, Prescribing, Administration and Monitoring of Anticoagulant Therapy.

Document Summary

This guideline summaries best practise for anticoagulation therapy

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Author of Guideline	

Document control

VERSION	SUMMARY OF CHANGES	DATE
5	Complete review	October 2017

Important Note:

The Intranet version of this document is the only version that is maintained.

Any printed copies should therefore be viewed as 'uncontrolled' and, as such, may not necessarily contain the latest updates and amendments.

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1 SCOPE

This guideline applies to all staff and services within Wye Valley NHS Trust.

2 INTRODUCTION

This guideline should be read in conjunction with departmental guidelines on Thromboprophylaxis and in conjunction with the Trust VTE policy and Policy on the use of anti-embolic stockings. It also incorporates guidance produced by NICE in this area.

3 STATEMENT OF INTENT

This guideline is adapted from those written by the British Committee on Standards in Haematology on Use and monitoring of Heparin (2006), Oral anticoagulation (2011). and Peri-operative Management of Anticoagulation and antiplatelet Therapy (2016)

4 DEFINITIONS

Anticoagulant	An agent that affects the normal process of coagulation of blood.
DOAC	Direct Oral Anticoagulant Oral anticoagulants that inhibit Factor X (Dabigatran) or Factor Xa (Rivaroxaban, Apixaban, Edoxaban).
VTE	Venous thromboembolism
AF	Atrial fibrillation
INR	International Normalised ratio
LMWH	Low molecular weight heparin

5 DUTIES

5.1 The Director of Service Delivery Improvement

The Medical Director is the accountable Director for this policy.

5.2 Medical, Nursing and Laboratory staff

All staff involved in prescribing, dosing or administering anticoagulant therapy should read this document along with other National and departmental guidance in this area.

6 Use, Initiation, monitoring and discontinuation of Anticoagulant therapy

Decision to prescribe anticoagulation therapy, including indication, duration and intensity of treatment, must be made by a senior clinician responsible for patient or a junior doctor following departmental guidance. A baseline coagulation screen should be taken in all patients together with baseline renal and hepatic function and FBC to determine platelet count.

Prior to prescribing anticoagulants it is important to make an assessment of the risk:benefit ratio for each individual patient. This should take into account the patient's ability to comply with administration and monitoring, co-morbidity and possible drug interactions. The prescriber **must have** undertaken training on "prescribing of anticoagulants" and be able to produce written documentation to this effect. The certificated BMJ programme on starting and maintaining patients on anticoagulants is an example of the type of learning advised for this purpose. (www.learning.bmj.com)

6.1 Before starting treatment

- Inform patient of reason, risks and benefits of oral anticoagulation
- Carry out relevant thrombotic risk CHA_2DS_2VASc and bleeding scores (HAS-BLED) to help clarify risk:benefit ratio.
- If warfarin (or other oral vitamin K antagonist) is being used - provide anticoagulation pack (information booklet with alert card and yellow record book) and Trust information leaflet and counsel about bleeding risk, drug interactions and need for regular INR monitoring. For Direct Oral Anticoagulants (DOACs) issue patient with appropriate card/booklet and advice.
- For patients on warfarin - refer to appropriate community/hospital based clinic for follow-up testing and dosing. Ensure information regarding indication, target INR and duration of anticoagulant therapy is relayed along with additional information on historical INRs/doses of warfarin given. For other anticoagulants, refer to the SPC (Summary of Product Characteristics) for standard monitoring advised.
- Sensitivity to warfarin is increased in frail sick patients, those aged >80yrs or who are significantly underweight, those who have congestive cardiac failure or abnormal liver function, and those who are receiving parenteral nutrition or drugs that potentiate warfarin significantly (see appendix 1 BNF)
- Once decision is made to give warfarin, review patient's medication history, including any herbal remedies, to determine if any interact significantly with warfarin consider whether alternatives could be substituted or medications discontinued. This is particularly important for medications taken on an 'as required' basis e.g. NSAIDs, where the interaction may be inconsistent.

6.2 Indications for treatment

These are summarised in Table 1 and further information follows the table.

Table 1 Anticaogulant Indication and Choice of Treatment

Indication	Choice of agent	Duration	Target INR (range) if warfarin used
Proximal VTE or PE	Warfarin or DOAC	6 months and review - if persisting risk factors/ unprovoked consider long term treatment	2.5 (2-3)
Calf vein thrombosis	Warfarin or DOAC	3 months	2.5 (2-3)
Calf vein thrombosis (with precipitating factors)	Warfarin or DOAC	6 weeks	2.5 (2-3)
Recurrent VTE	Warfarin or DOAC	Indefinite	2.5 (2-3)
Recurrent VTE whilst taking warfarin	Warfarin or DOAC	Indefinite	3.5 (3-4)
Atrial fibrillation	Warfarin or DOAC	indefinite	2.5 (2-3)
Prosthetic heart valve	Warfarin	Indefinite	As per product information AVR usually 2.5 MVR 2.5-3.5
Atrial fibrillation awaiting cardioversion	Warfarin or DOAC	>4 weeks	3.0 (2.5-3.5)

6.2.1 Acute Venous thromboembolism

Patients with either a deep vein thrombosis (DVT) or pulmonary embolism (PE) should initially receive low molecular weight heparin (LMWH) at therapeutic dose (minimum 5 days and until INR >2 for two consecutive readings) and should also be commenced on warfarin (as per loading schedule) **or** commenced on one of the DOACs (apixaban/edoxaban/rivaroxaban/dabigatran). Please note that edoxaban and dabigatran recommend 5 days LMWH prior to commencing them. The schedule for dose initiation with warfarin is given on the Warfarin Chart based on the Fennerty scale (see Appendix 1).

Patients on warfarin should have a target INR of 2.5 and duration of anticoagulation dependent on the extent/type of thrombosis (usually 3 or 6 months).

Some patients (those with cancer on treatment or intravenous drug abusers) are more suitable for continued use of LMWH due to difficulties with warfarin monitoring and control in these groups of patients.

Patients with large Ileo-femoral DVTs or patients with massive PE should be considered for thrombolytic therapy. Please discuss **ALL** cases of ileo-femoral DVT with vascular surgeons for advice on whether thrombolytic therapy is indicated. Remember patients with **unprovoked VTE** may have an underlying malignancy and consideration should be given to screening for this (NICE guidelines 2010). In addition such patients may benefit from lifelong therapy.

6.2.2 Recurrent Venous Thromboembolism

Following 1 or more unprecipitated venous thrombotic events it is generally recommended that patients should receive life long anticoagulation with warfarin (target INR 2.5) or an alternative in view of the high risk of recurrence. Patients who have suffered recurrent thrombosis whilst on warfarin should have a higher target INR of 3.5.

6.2.3 Atrial Fibrillation

Patients with AF should be considered for lifelong anticoagulation with a DOAC or warfarin with a target INR of 2.5. A lower dose warfarin loading schedule (e.g. 5mg daily with INR check on Day 5) is generally advised for this group of patients. Patients should be counselled regarding the advantages and disadvantages of these agents.

6.2.4 Cardioversion

Patients should be effectively anticoagulated for 3 weeks pre and 4-6 weeks post cardioversion to reduce the risk of mural thrombi. A target INR of 3 is advised pre-cardioversion in order to reduce the likelihood of cancellation due to inadequate INR levels. DOACs may also be used in this setting.

6.2.5 Prosthetic Heart Valves

The frequency of thromboembolism with modern valves is significantly lower than that seen with first generation valves and many manufacturers now recommend a specific target INR for their valve type. If the type of valve is unknown a target INR of 3.0 for aortic valves and 3.5 for mitral valves should be used. DOACs are not currently licensed for use in this setting.

6.2.6 Acute arterial embolism proceeding to embolectomy

These patients should be considered for long term anticoagulation with warfarin with an INR target of 2.5. DOACs are not currently licensed for use in this setting.

6.2.7 Dilated Cardiomyopathy

If anticoagulated to prevent systemic embolus, INR target 2.5. DOACs are not currently licensed for use in this setting.

6.2.8 Antiphospholipid Syndrome

Patients with APLS have a higher risk of both venous and arterial thrombosis. A target INR of 2.5 is sufficient for the management of VTE and arterial thrombosis in this group of patients. DOACs are not currently licensed for use in this setting.

6.2.9 VTE Prophylaxis

All patients should undergo a risk assessment for VTE on admission to hospital and 24 hours post admission, using the electronic proforma available on MAXIMS Electronic Patient Record. All patients should also receive written information on “Preventing thrombosis when in hospital (2009)”. Guidance is detailed in Pr.98 Prophylaxis against Venous Thromboembolism Policy.

6.2.9.1 VTE prophylaxis in Orthopaedic patients

Patients undergoing major elective orthopaedic surgery should be offered mechanical prophylaxis where available and receive LMWH prophylaxis. LMWH/rivaroxaban prophylaxis should also be considered in patients following fractured neck of femur, major trauma and in those with lower limb plaster cast if other risk factors for VTE are present. Patients having hip/knee replacement

surgery or post hip fracture with one or more risk factors for VTE should be considered for the use of continued thromboprophylaxis (with rivaroxaban 10mg or LMWH) for 2 (TKR), 4 (THR) weeks post-surgery. Further information is found on the Medicine Related Guideline "Guidance for Thromboprophylaxis, for use with the VTE Risk Assessment"

6.2.9.2 VTE prophylaxis in general and gynaecological surgery

All such patients should be offered mechanical prophylaxis and be considered for LMWH/alternative at prophylactic dose if high risk on assessment. **Please refer to departmental guidelines and pre-operative assessment guidelines for further more detailed information.**

6.2.9.3 VTE prophylaxis in medical patients

Most VTE (>60%) in hospitalised patients now occurs in medical patients due to the high use of LMWH prophylaxis in surgical practice. LMWH prophylaxis has been shown to significantly reduce the risk of symptomatic VTE in medical patients. Therefore patients should receive LMWH prophylaxis if they fall into the following categories:

- Acute MI or coronary syndrome
- Acute severe infection
- Active malignancy on treatment
- Ischaemic CVA or paraplegia
- Cardiac failure (WHO grade 3 or 4)
- Severe COPD/respiratory failure
- Patients requiring critical care

In addition it should be considered on an individual basis in the following groups:

- Obese (BMI >30Kg/m^2
- Active cancer or cancer treatment
- Known thrombophilia or previous history of VTE
- Prolonged immobility
- Age > 60 years
- Hormone therapy
- Varicose veins with phlebitis
- Dehydration
- Nephrotic syndrome.
- First degree relative with history of VTE

6.3 Contraindications to Anticoagulation

Contraindications to prophylactic pharmacological anticoagulation include:

- active bleeding
- recent haemorrhagic stroke (within 14 days)
- inherited or acquired bleeding disorder
- uncontrolled hypertension (BP>230/120)
- thrombocytopenia (platelets <75 x 10^9/L)
- the patient declines this therapy

Patients undergoing neurosurgery/spinal surgery/eye surgery or within 4 hours of epidural/spinal anaesthesia/lumbar puncture should also not be given pharmacological thromboprophylaxis.

In patients who are not deemed suitable for pharmacological thromboprophylaxis, anti-embolic stockings or other mechanical forms of thromboprophylaxis should be

considered – please refer to "Guidelines on the use of Anti-embolic stockings" (2010). In patients with acute stroke, the Stroke Pathway states that Intermittent Pneumatic Compression sleeves are used unless contraindicated.

6.4 Prescribing anticoagulants

Prior to prescribing anticoagulants it is important to make an assessment of the risk:benefit ratio for each individual patient. This should take into account the patient's ability to comply with administration and monitoring, co-morbidity and possible drug interactions. Any patient with a history of Heparin Induced Thromboytopenia (HIT) should not receive any form of heparin but be considered for use of a heparinoid (danaparoid) or lepuridin or a DOAC. The prescriber **must have** undertaken training on "prescribing of anticoagulants" and be able to produce written documentation to this effect. The certificated BMJ programme on starting and maintaining patients on anticoagulants is an example of the type of learning advised for this purpose.

It must be noted that LMWH has reduced excretion in renal impairment and caution should be used in this clinical setting. LMWHs at therapeutic dose **must** be dosed on actual body weight and for this reason the weight of the patient must be accurately recorded on the in-patient medication chart along with the a record of the patient's renal function. Doses may be rounded to within 10% of calculated dose for ease of administration. When prescribing treatment dose LMWH, the Enoxaparin "thromboprophylaxis" prescription on the inpatient medication chart must be scored out.

Warfarin prescription charts (example in Appendix 1) are in use in the trust and should be fixed to the inpatient medication chart.

When prescribing a DOAC, the drug chart must be checked and any LMWH must be stopped (scored out, signed and dated) before the DOAC is commenced.

Biosimilar enoxaparin (Inhixa®) must be prescribed by brand name.

6.5 Administration

Warfarin and the other oral anticoagulants are best taken at a similar time each day. Whilst inpatients, administration of warfarin at 2pm is recommended so that the check of INR and prescription can be completed by the day medical team.

LMWH should be administered by a trained and competent nurse or the patient taught to self–inject. The licensed site for injection is the upper abdominal wall. Where patients are taught to self-inject, care must be taken to ensure doses can measured with ease.

6.6 Monitoring

LMWH does not require monitoring at prophylactic or therapeutic doses in usual situations. Monitoring using an anti-Xa assay should be considered in individuals in whom pharmacokinetics may be altered (severe renal failure, obese, pregnancy, neonates and infants) although evidence suggests it has poor predictive value for bleeding or thrombosis. Samples **must be taken 4-6 hours after sc administration and arranged with the laboratory directly (ext 5710).**

Unfractionated heparin (UFH) should be monitored by the APTT ratio.

Warfarin (and other oral vitamin K antagonists (e.g. acenocoumarol, phenindione) are monitored by the INR. The frequency of INR monitoring is dictated by the interval length and stability of the previous INR values. A therapeutic INR should be within 0.5 of the target value. For patients who lie outside of this – small (10%) dose adjustments should be made. Due to the long half-life of warfarin, repeat INRs should be undertaken not sooner than 48 hours after dose change. Guidance on what to do with INR's out of range is found on the inpatient Warfarin anticoagulant chart.

Rivaroxaban, Apixaban, Edoxaban and Dabigatran have a predictable anticoagulant effect and require no monitoring of anticoagulation in normal circumstances. However regular monitoring of renal and hepatic function is suggested at least annually and more often for patients with renal/hepatic impairment. For selected patients, anti Xa activity may be required (on the advice of a consultant haematologist).

6.7 Discontinuation

Concern about a rebound "hypercoaguable " state after discontinuing warfarin or other anticoagulants is unfounded and therefore warfarin and other anticoagulants can be discontinued abruptly when the duration of therapy is completed.

6.8 Rapid Induction of Warfarin (with concurrent heparin)

However rapidly treatment with warfarin is initiated, coagulation will not be inhibited for 72 hr because warfarin does not affect the action of clotting factors already synthesised. The recommended regime (for DVT, PE) is detailed on the inpatient warfarin anticoagulation chart (Appendix 1), separately for patients below 75 years and for patients greater than 75 years, or those with cardiac or liver failure. This allows the maintenance dose of warfarin to be predicted over 4 days, by optimal interpretation of **timed** daily INR measurements. The INR is used to guide the selection of daily warfarin dose, even during concurrent anticoagulant treatment with unfractionated heparin, or low-molecular-weight heparin. LMWH should be continued until the INR is in the therapeutic range on two consecutive occasions and for a minimum of 5 days.

6.9 Reversal of anticoagulation

6.9.1 Warfarin: In the emergency setting (<6hrs)

When there is significant or life threatening haemorrhage or need for emergency surgery/invasive procedure, warfarin should be **fully reversed** using a combination of Prothrombin Complex Concentrate (PCC) at 30-50 units/Kg (e.g. Octaplex®) and vitamin K (10mg IV).

6.9.2 Warfarin: For less urgent reversal

A small (1-2mg dose or vitamin K orally or IV) will often reduce the INR to a satisfactory level for surgery/invasive procedure to be carried out.

6.9.3 Warfarin: In the elective setting

Warfarin should be stopped 5 days prior to surgery or invasive procedure with bleeding risk. Selected high risk patients only should be considered for "bridging" therapy with LMWH (see protocols for bridging therapy).

6.9.4 DOACs

Due to the short half-life of these agents reversal may not be required. However in the emergency situation consider:

- Activated charcoal to reduce absorption if <2 hours after dose administration
- Discuss with consultant haematologist use of PCC in life threatening haemorrhage or need for emergency surgery.

For elective surgery, DOACs should be discontinued for 24-96 hours pre op (depending on patient's renal function – see SPC of individual drugs for further details or British Society of Haematology guidelines on peri-operative management below.)

Renal Function CrCl ml/min	Estimated half-life (hours)	Low bleeding risk	High bleeding risk
Dabigatran			
>80	13	24 hours	48 hours
>50 to <80	15	24-48 hours	48-72 hours
>30 to <50	18	48-72 hours	96 hours
Rivaroxaban			
>30	9	24 hours	48 hours
<30		48 hours	72 hours
Apixaban			
>30	8	24 hours	48 hours
<30		48 hours	72 hours
Edoxaban			
>30	10-14	24 hours	48 hours
<30		48 hours	72 hours

*All decisions need to consider state of haemostasis and new acquired risk factors for bleeding

Table 2 Stopping DOACs before surgery or invasive procedures for which anticoagulation needs to be stopped

6.10 Re-starting anticoagulation post interruption for e.g. surgery

Due to its slow onset of action warfarin can be resumed, at the normal maintenance dose or with two initial days of double maintenance dose the evening of surgery (or the next day) if there is adequate haemostasis. For some high bleeding risk procedures, therapeutic anticoagulation should not be re-introduced until >48hrs from the procedure.

Following minor or low risk procedures in patients with low bleeding risk, anticoagulation with DOACs can be recommenced 6-12 hours post procedure if

haemostasis has been fully secured. Following high risk procedures and in patients with an increased bleeding risk or in any situation where any increased risk of bleeding is unacceptable, DOACs should not be re-introduced at full dose until at least 48 hours post procedure.

6.11 Patient education and information

All patients on long term anticoagulants should receive appropriate information about the risks and benefits of this treatment and be involved in the decision to commence them. All patients prescribed warfarin should be issued with a "yellow book" and information pack (NPSA 2007). Prior to discharge from hospital, patients on warfarin should be given an appointment for anticoagulant monitoring either at the hospital clinic or through their GP surgery.

It is **imperative** that adequate information is relayed to the clinic/GP so that safe monitoring can be undertaken. Details of the drug dose and monitoring requirements should be detailed in the Electronic Discharge Summary (EDS). **A copy of the in-patient anticoagulation record will be sent for this purpose (included with the patient discharge medication by Pharmacy when the discharge is processed through Pharmacy) and the GP/clinic should receive a fax or phone call on the day of discharge detailing follow-up requirements.**

Patients on DOACs should receive a product specific information card and given advice on frequency of monitoring of other parameters (renal and liver function). This will be included in the medication pack, but additional copies and specific patient advice leaflets are available from the manufacturers.

All patients should be given verbal and written information on the risk of VTE on admission to and discharge from hospital. Information booklets "Preventing thrombosis when in hospital" and "Blood clots – am I at risk?" can be used for this purpose.

7 TRAINING

All staff are required to undertake training and competency assessment in line with their role.

8 MONITORING COMPLIANCE WITH THIS DOCUMENT

The table below outlines the Trusts monitoring arrangements for this policy/document.

Aspect of compliance or effectiveness being monitored	**Monitoring Method**	**Individual responsible for the monitoring**	**Frequency of the monitoring activity**	**Group/ committee which will receive the findings / monitoring report**	**Group / committee / individual responsible for ensuring that the actions are completed**
Training of prescribers of Anticoagulants.	Compliance of new Drs with mandatory training (Passport)	PGMC staff –	Annually	Medicine Safety Committee	Post graduate tutor
Training of nursing staff to administer LMWH	PDC records	PDC staff	Annually	Medicine Safety Committee	PDC lead

9 REFERENCES/ BIBLIOGRAPHY

Guidelines on oral anticoagulation (warfarin) – Fourth edition 2011. British Journal of Haematology 2011 1365-2141

Guidelines on the use and monitoring of heparin. British Journal of Haematology 2006; 133; 19-34.

Guidelines on Perioperative management of anticoagulants and anti-platelet therapy. British Journal of Haematology 2016 175 (4) 602-613

American Society of Clinical Oncology Guideline: Recommendations for VTE prophylaxis and treatment in patients with cancer. Journal of clinical Oncology, 2007:14; 1283

NPSA /2007/18

NICE clinical guidance 92: Venous thromboembolism: reducing the risk (Jan 2010, updated 2015)

Guidelines on the use of anti-embolic stockings. March 2015 (WVT)

10 RELATED TRUST POLICY/PROCEDURES

Policy PR91 – Guidelines on the use of Anti-Embolic Stockings

Policy PR98 – Prophylaxis against Venous Thromboembolism Policy

11 EQUALITY IMPACT ASSESSMENTS

1	**Name and Job Title of person completing assessment**	
2	**Name of service, policy or function being assessed**	Use, monitoring, prescribing and administration of Anticoagulants
3	**What are the main objectives or aims of the service/policy/function?**	Ensure safe prescribing of anticoagulants
4	**Date**	26/4/16

Stage 1: Initial Screening			
5	**What evidence is available to suggest that the proposed service/policy/function could have an impact on people from the protected characteristics? Document reasons, e.g. research, results of consultation, monitoring data and assess relevance as: *Not relevant or Relevant Low/Medium/High***		
Protected Characteristic		Relevance	Evidence
A	Race	Nil	
B	Religion/Spirituality	Nil	
C	Gender	Nil	
D	Disability	Nil	
E	Sexual Orientation	Nil	
F	Age	Nil	
G	Pregnancy/maternity	Nil	
H	Gender reassignment	Nil	
I	Marriage and Civil Partnership	Nil	
J	Carers	Nil	
If you assess the service/policy/function as **not relevant**, please proceed to section 11. If you assess the service/policy/function as **relevant**, continue to Stage 2, Full Equality Impact Assessment.			

Stage 2: Full Equality Impact Assessment		
6	**Are there service user, public or staff concerns that the proposed service/policy/function may be discriminatory, or have an adverse impact on people from the protected characteristics?**	
A	Public	
B	Staff	
If there are **no concerns** proceed to section 11. If there **are concerns,** amend service/policy/function to mitigate adverse impact, consider actions to eliminate adverse impact, or justify adverse impact		
7	**Can the adverse impact be justified**	
8	**What changes were made to the service/policy/function as result of information gathering?**	
9	**What arrangements will you put in place to monitor impact of the proposed service/policy/function on individuals from the protected characteristics?**	
10	**List below actions you will take to address any unjustified impact and promote equality of outcome for individuals from protected characteristics. Consider actions for any procedures, services, training and projects related to the service/policy/function which have the potential to promote equality.**	

Action	Lead	Timescales

11	**Review date**	
I am satisfied that this service/policy/function has been successfully equality impact assessed. Date: 25/4/16 Author:		
Please send the completed assessment for scrutiny to: Quality & Safety Manager, Quality & Safety Manager, Trust HQ, County Hospital, Union Walk, Hereford. HR1 2ER.		

Appendix 1

Wye Valley NHS Trust

Adult Inpatient Warfarin Dosing and Prescription Chart

Prescribe warfarin on the in-patient chart, write "**see warfarin treatment chart**" and attach this sheet securely to the chart.
All doses must be given between 14.00 – 1800 hours. If warfarin temporarily withheld write "**OMIT**" on this chart.

Ward:	☐ New Treatment	☐ Continuing Treatment	**Affix addressograph label here**
	INR before starting warfarin	Warfarin dose on admission	Name:
Consultant:	Follow induction nomogram below	Follow maintenance dosing overleaf	Hospital Number:
	Patient educated	☐ Patient educated	Date of birth:
	Yellow booklet given	☐ Patient has yellow booklet	

Current INR service provider: GP surgery / Hosp clinic

Interacting drugs:

Duration of warfarin for specific clinical indications	√	Duration	Target INR (range)
Spontaneous Proximal VTE or PE		6 months (consider lifelong)	2.5 (2-3)
Proximal VTE with precipitating factors		3 months	2.5 (2-3)
Calf vein thrombosis		6 weeks	2.5 (2-3)
Recurrent VTE (off anticoagulants)		Long-term	2.5 (2-3)
Recurrent VTE (whilst taking anticoagulants)		Long-term	3.5 (3-4)
Atrial fibrillation / flutter		Long-term	2.5 (2-3)
Prosthetic heart valve		Long-term	Seek specialist advice
Atrial Fibrillation awaiting cardioversion		> 3 weeks	3.0 (2.5-3.5)
Other (specify)			

It is mandatory that all patients receive a follow-up appointment for INR monitoring prior to discharge – contact GP surgery ☐ (tick to confirm)

Give low molecular weight heparin for a minimum of 5 days (see BNF for special precautions) or until the INR is in the target range for 2 consecutive days (whichever is longer)

Date	INR result	Warfarin dose (mg)	Prescriber (Signature)	Next test (date)	Given by	Time & Date
	Baseline					

* Post operative patients should preferably be restarted on their normal maintenance dose rather than reloaded.

** Patients on alternate Vitamin K antagonists (Sinthrone) should be discussed with the Anticoagulation Team on ext. 4447.

In-patient Anticoagulant dosing chart Dr L Robinson Jul 2015 v1

Nomograms for the loading of warfarin
(See over leaf for maintenance dosing and note below regarding Post-op patients)

Rapid initiation of warfarin for patients under 75 years (Fennerty scale)

Day	INR (Best taken 0900-1000)	Warfarin dose (mg) (Best given 1700-1800)
Day 1	<1.4	10
Day 2	NO INR REQ	10
Day 3	<2.0	10
	2.0 to 2.1	5
	2.2 to 2.3	4.5
	2.4 to 2.5	4
	2.6 to 2.7	3.5
	2.8 to 2.9	3
	3.0 to 3.1	2.5
	3.2 to 3.3	2
	3.4	1.5
	3.5	1
	3.6 – 4.0	0.5
	>4.0	0
Day 4 and predicted dose for **Days 5-7**. Check INR on day 8 and dose as overleaf.	<1.4	>8
	1.4	8
	1.5	7.5
	1.6 to 1.7	7
	1.8	6.5
	1.9	6
	2.0 to 2.1	5.5
	2.2 to 2.3	5
	2.4 to 2.6	4.5
	2.7 to 3.0	4
	3.1 to 3.5	3.5
	3.6 to 4.0	3
	4.1 to 4.5	Miss one dose then 2mg
	>4.5	Miss two doses then 1mg

Rapid initiation of warfarin for patients over 75 years, cardiac failure or liver failure

Day	INR (Best taken 0900-1000)	Warfarin dose (mg) (Best given 1700-1800)
Day 1	<1.4	5
Day 2	NO INR REQUIRED	5
Day 3	NO INR REQUIRED	5
Day 4	NO INR REQUIRED	5
Day 5 and continue same dose until day 8	< 1.7	5
	1.8-2.2	4
	2.3-2.7	3
	2.8-3.2	2
	3.3-3.7	1
	>3.7	0

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MAINTENANCE DOSING IN PATIENTS PREVIOUSLY STABILISED ON WARFARIN
(Maintenance dosing for patients admitted on warfarin or newly warfarinised patients from day 8)

- **Before prescribing warfarin for an in-patient always:**
  - perform a baseline INR;
  - review patient hand held/computerised records for previous results and the current trend in the INR;
  - review the drug chart – has a new treatment been started or stopped e.g. antibiotics, amiodarone?
- **REMEMBER:**
  - many drugs can interact with warfarin, increasing/decreasing the patient's sensitivity to it;
  - starting or stopping drugs will affect the INR approximately 3 days later;
  - altering the dose of warfarin will affect the INR approximately 3 days later;
  - **IF YOU ARE UNSURE WHAT TO DO, SEEK ADVICE.**

Target INR	Actual INR	Action
2.5 3.5	1.8 – 3.2 2.8 - 4.2	**Do not adjust warfarin dose.** Check INR every 3-4 days
2.5 3.5	≥ 3.3 but < 6.0 ≥ 4.3 but < 6.0	**Reduce dose of warfarin by up to 25%.** Review preceding INR results and elicit any recent change in medication to determine the trend in change. If necessary monitor INR daily. Where possible avoid altering warfarin dose more frequently than every 3rd day.
2.5 3.5	1.5 – 1.8 1.5 – 2.8	**Increase dose of warfarin by up to 25%.** Review preceding INR results and elicit any recent change in medication to determine the trend in change. If necessary monitor INR daily. Where possible avoid altering warfarin dose more frequently than every 3rd day.
ANY	< 1.5	**Consider use of a therapeutic dose of Low Molecular Weight Heparin** (see BNF for special precautions) until the INR is in target range for 2 consecutive days. (for patients with prosthetic heart valves discuss with their cardiologist/cardiac surgeon/haematologist)

SPECIAL CIRCUMSTANCES

- **Reversal of warfarin for emergency surgery**: discuss with haematologist.
- **Reversal of warfarin for patients with prosthetic heart valves**: discuss with a cardiac surgeon / cardiologist

MANAGEMENT OF A HIGH INR

The following recommendations are adapted from those of the British Society for Haematology. If you are unsure, consult a haematologist (or cardiac surgeon if the patient has a heart valve).

INR in therapeutic range – patient bleeding

- Investigate source of bleeding. Consider risk/benefit of stopping warfarin.

INR < 8.0 but > 0.7 above target INR – no bleeding

- Reduce the dose following the 'Maintenance Dosing' table above.

INR > 8 – no bleeding or minor bleeding from mucosae (nose, oropharynx, urinary tract, rectum, anus)

- Stop warfarin
- Restart when INR < 5.0
- Assess patient for their risk of bleeding: recent surgery/trauma, extensive bruising, minor mucosal bleeding. If at high risk of bleeding give Vitamin K 1-2mg orally: Use 0.1-0.2 ml Konakion® MM paediatric (phytomenadione 2mg in 0.2ml). Draw up using oral dispenser provided, then drop onto the tongue.
- Recheck INR after 24 hours, repeat dose of Vitamin K if INR is still too high.

Major bleeding: Life or limb threatening bleeding, including intracranial haemorrhage

- Stop warfarin
- Give 10mg vitamin K IV (1ml phytomenadione 10 mg/ml – Konakion MM®.) Give as an IV bolus over 3-5 minutes undiluted or diluted with 10-20ml with glucose 5% to aid slow administration.
- Give prothrombin complex concentrate (PCC – Factor II, VII, IX and X concentrate) – dose to be advised by Consultant Haematologist. Dissolve in water for injection as per manufacturer's guidance, using an aseptic technique and the provided transfer device. Administer over 10 minutes. See local protocol for further details on administration.
- Repeat INR within 1 hour of giving of PCC – consider further dose if INR remains >1.5 and patient still bleeding.
- Consider risk/benefit of recommencing warfarin.

DISCHARGE

- Make arrangements for the patient to have his/her INR checked within seven days of discharge (three days if an interacting drug is being stopped or started).
- Use your local care pathway to ensure that accurate information is shared with the out-patient clinic or GP