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This Medicines Information Leaflet is produced locally to optimise the use of medicines by encouraging prescribing that is safe, clinically appropriate and cost-effective to the NHS.

The management of warfarin during inpatient admission

The management of patients established on warfarin can be difficult during admission to hospital due to changes that can affect warfarin requirements. These could include alterations in dietary intake, interacting medicines, acute infection, diarrhoea and vomiting and dehydration. This guideline aims to provide some advice on how to manage the complexities of warfarin and support maintaining a patient's INR within their target range. For advice on initiating warfarin refer to MIL Vol 5, No. 8 and for peri-operative management, MIL Vol 10, No. 5.

On admission to hospital, it is vital prescribers and pharmacists establish and verify the following:

1. Indication for anticoagulation
2. Target INR range
3. Usual dosing regimen
4. Current INR

The patient or carer will often be able to provide this full information. However, where this is not possible other sources should be used. These could include the patient's handheld anticoagulation therapy record or alert card. Most Oxfordshire patients will be managed by the Oxfordshire Anticoagulation Service who can be contacted for this information. Outpatient results for these patients can be viewed on EPR under pathology lab results. For out of area patients either contact the patient's anticoagulation service or GP.

Maintenance dosing

Doses of warfarin are calculated in milligrams of warfarin per week and doses can vary widely between different patients. The total weekly dose should be divided up across the week as evenly as possible.

e.g. weekly dose of 32mg

Mon	Tue	Wed	Thurs	Fri	Sat	Sun
5mg	4mg	5mg	4mg	5mg	4mg	5mg

NB: The Oxfordshire Anticoagulation service does not advocate the use of half milligram doses or 0.5mg tablets except for patients who have proven to be extremely sensitive to warfarin and require a dose of less than 1mg per day. For patients admitted on 0.5mg doses, tablets can be ordered from pharmacy if required.

On admission, if the patient's INR is within range, it is generally recommended to continue the patient's usual dose of warfarin. A quick reference guide for prescribing warfarin is available. To change a dose, it is recommended that the original prescription is modified.

INR testing

INRs should usually be checked every 72 hours for patients in hospital. However, for some patients an INR may need to be checked every 24 hours e.g. those with erratic INRs, those on combined therapy with LMWH, or during initiation or cessation of interacting medicines. Tests and dose changes should be planned during the working day to avoid handing over to the on call at evenings and weekends.

Special Considerations

a. Interacting Medicines – starting or stopping

When commencing any new medicine, please be aware of possible interactions with warfarin; almost any medicines can interact with warfarin. Stopping a medicine can also have an impact on INR control. In cases of well-known drug interactions, anticipatory changes in warfarin doses may be considered alongside daily INR monitoring. Some common examples which can increase the INR include amiodarone, azole antifungals (e.g., fluconazole), ciprofloxacin, clarithromycin, metronidazole,

simvastatin and cefazolin. Conversely carbamazepine, phenytoin and rifampicin can all decrease the INR. This can be discussed with a pharmacist or the anticoagulation inpatient safety nurse for further information.

b. Infection

Infection has been shown to be a major contributing factor for raised INRs. This can be caused by the hypermetabolism and clearance of vitamin K-dependent clotting factors in pyrexia, which may be compounded by reduced oral intake, dehydration and interacting antimicrobials. **Patients may require daily INR monitoring during the acute phase and reduced warfarin doses.**

c. Heart failure, shock, and acute cardiac dysfunction

Hepatic congestion caused by acute or chronic cardiac dysfunction can significantly alter metabolism of warfarin and liver synthetic function, most commonly increasing INR. Monitor INR levels closely in patients with severe heart failure or peripheral oedema and consider reducing or omitting warfarin doses.

Adjusting a patient's warfarin dose

Before changing a patient's warfarin dose, you will need to consider:

- the indication for anticoagulation
- their target range
- usual doses of warfarin
- current trend in INRs
- if there are any missed doses
- if there are any causes for deranged INR(s)

Assessment of the patient's clinical condition and possible interactions should also be reviewed. It will take approximately 3-4 days for a dose change to be seen in the INR result. Avoid altering warfarin dose more frequently than every third day. Avoid 'yo-yo' dosing, if the dose of warfarin jumps up and down then so will the INR. Tables 1, 2 and 3 provide some guidance on suggested dose adjustments accounting for the most recent INR result.

If you are unsure of how to amend a warfarin dose you can contact the anticoagulation inpatient safety nurse or an anticoagulation pharmacist. At weekends the DVT nurse specialist can be contacted for advice between 08:00-13:00 on bleep 5165.

Table 1: Warfarin dose adjustment, INR target range 2-3

Current INR	Action
Less than or equal to 1.6	Increase weekly dose by 20% and monitor INR daily. Consider bridging with treatment dose LMWH for patients at high thrombotic risk* and stop LMWH once INR in range.
1.7-1.8	Increase overall weekly dose by 10% and monitor INR daily.
1.9-3.1	No change to doses. Monitor INR every 72 hours if stable.
3.2-4.0	Decrease overall weekly dose by 10% and monitor INR every 24-48 hours.
4.1-5.0	Stop for 1 day and reduce overall weekly dose by 20%. Monitor INR daily.
5.1-7.9	Stop warfarin and restart at 20% reduced weekly dose once INR less than 5. Monitor INR daily.
8.0 or greater	Please see reversal guidelines for vitamin K antagonists

Table 2: Warfarin dose adjustment, INR target range 2.5-3.5

Current INR	Action
Less than or equal to 1.9	Increase weekly dose by 20% and monitor INR daily. Consider bridging with treatment dose LMWH for patients at high thrombotic risk* and stop LMWH once INR in range.
2-2.3	Increase overall weekly dose by 10% and monitor every 24-48 hours.
2.4-3.6	No change to doses. Monitor INR every 72 hours if stable.
3.7-4.5	Decrease overall weekly dose by 10% and monitor INR every 24-48 hours.
4.6-5.5	Stop for 1 day and reduce overall weekly dose by 20%. Monitor INR daily.
5.6-7.9	Stop warfarin and restart at 20% reduced weekly dose once INR less than 5. Monitor INR daily.
8.0 or greater	Please see reversal guidelines for vitamin K antagonists

Table 3: Warfarin dose adjustment, INR target range 3-4

Current INR	Action
Less than or equal to 2.4	Increase weekly dose by 20% and monitor daily. Consider bridging with treatment dose LMWH for patients at high thrombotic risk* and stop LMWH once INR greater or equal to 2.5.
2.5-2.8	Increase overall weekly dose by 10% and monitor INR every 24-48 hours.
2.9-4.1	No change to doses. Monitor INR every 72 hours if stable.
4.2-5.1	Decrease overall weekly dose by 10% and monitor INR every 24-48 hours.
5.2-6.0	Stop for 1 day and reduce overall weekly dose by 20%. Monitor INR daily.
6.1-7.9	Stop warfarin and restart at 20% reduced weekly dose once INR less than 5. Monitor INR daily.
8.0 or greater	Please see reversal guidelines for vitamin K antagonists

*Refer to table 4 (see below)

Sub-therapeutic INRs

Once the INR drops below a patient's target range they are at increased risk of thrombosis. Patients with a high thrombotic risk are outlined in table 4 and should be considered for therapeutic dose LMWH. If you are unsure if a patient is considered high risk, advice is available from the Haemostasis Registrar. Patients on concurrent therapeutic LMWH and warfarin treatment must have daily INRs. For low-risk patients, complete a VTE risk assessment and consider appropriate VTE prophylaxis until INR is back in range or the patient is discharged.

Anticoagulation optimisation

The anticoagulation team can be contacted for advice if considering a switch from warfarin to a Direct Oral Anticoagulant (DOAC). Most patients remaining on warfarin either have contraindications to a DOAC or patient preference for warfarin.

Table 4: When to consider LMWH bridging in patients with sub-therapeutic INRs and high thrombotic risk

Condition	**Consider bridging with full treatment dose LMWH in**
VTE	Patients with a VTE within previous 3 months. Very high thrombotic risk patients such as patients with a previous VTE whilst on therapeutic anticoagulation Chronic Thrombo-embolic Pulmonary Hypertension (CTEPH) Triple positive antiphospholipid syndrome (Positive lupus anticoagulant, positive anticardiolipin and β2 GP1 antibodies)
AF	Patients with a previous stroke/TIA in last three months. Patients with a previous stroke/TIA and three or more of the following risk factors: • Congestive cardiac failure • Hypertension (greater than 140/90 mmHg or on medication) • Age over 75 years • Diabetes mellitus
Mechanical heart valve	All mechanical heart valve patients
Cardiac thrombus	Patients with ventricular thrombus

Discharge

Please inform the patient's local anticoagulation service when a patient is due to be discharged. Support can be provided with dosing advice, in helping to arrange INR testing on discharge and providing follow up. Please ensure that discharge summaries are completed accurately, and patients have clear written dosing instructions. Patients should be advised to test within 48 hours of discharge. Avoid routine Friday or weekend tests. If the 48-hour post discharge test falls within this time, please advise the patient to test the following Monday. If you feel an urgent INR is required before this, discuss with the anticoagulation service to arrange a suitable plan.

Contact details

- Anticoagulation inpatient safety nurse – EPR message centre 'Anticoagulation Inpatient Team'
- Anticoagulation pharmacists – bleep 7159 or 4511
- Anticoagulation service (Oxford) – bleep 1857, ext. 23729 or ac.services@ouh.nhs.uk

- Anticoagulation service (Banbury) – bleep 9614, ext. 29224 or achgh@ouh.nhs.uk
- Haemostasis SpR – bleep 5529, ext. 25302, EPR message centre 'Consult Haemostasis' or out of hours via switchboard

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References

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