1. Purpose of this document

1.1 The purpose of this document is to provide clear guidance for staff on the use and monitoring of Low Molecular Weight Heparins (LMWHs) for patients in the care of Torbay and Southern Devon Health and Care NHS Trust in community hospitals and community settings.

2. Introduction:

2.1 Heparin is the most widely used parenteral anticoagulant. It is available as Unfractionated Heparin (UFH) and Low Molecular Weight Heparin (LMWH). Advantages of LMWH include ease of administration, no need for monitoring in most cases, fewer side effects and possibly improved efficacy.

2.2 For patients within Torbay and Southern Devon Health and Care NHS Trust (TSDHCT) community hospitals LMWH would be the drug of choice where in patients are receiving venous thromboembolism prophylaxis or treatment for Deep Vein Thrombosis (DVT) or Pulmonary Embolism.

2.3 Where Unfractionated heparin is considered the drug of choice due to safety of heparin use, or where the requirement for rapid reversal may be required patients would require transfer to SDHFT or Derriford hospital.

2.4 There are a number of different LMWH preparations. TSDHCT currently use: Dalteparin sodium (Fragmin®) Enoxaparin sodium (Clexane®)
2.5 In community hospitals the decision to prescribe a LMWH to prevent a VTE should be based on the outcome of the VTE risk assessment. See ‘Venous Thromboembolism Prophylaxis in hospitalised patients’ guideline for more information.

3 Cautions/contraindications

3.1 Cautions / contraindications of LMWH include:
   - Active bleeding
   - Active peptic ulcer disease
   - Known bleeding disorder e.g. haemophilia
   - Thrombocytopenia (<60) including heparin induced thrombocytopenia.
   - Severe renal disease (CKD 4 and 5) (eGFR < 30 ml/min), creatinine clearance <30 ml/min or where a patient is suspected to have this degree of renal impairment.
   - Hepatic failure
   - Recent cerebral haemorrhage
   - Recent eye/neurosurgery
   - Uncontrolled severe hypertension
   - Known allergy to heparin
   - History of Heparin-induced thrombocytopenia
   - Acute bacterial endocarditis
   (See BNF/Summary of Product Characteristics).

4 Side effects:
4.1 Side effects to LMWH include: bleeding, thrombocytopenia (see below), osteoporosis, hyperkalaemia, injection site reactions, allergic reactions (including urticaria, angioedema and anaphylaxis).

4.2 Heparin Induced Thrombocytopenia (HIT) is an uncommon but potentially life-threatening complication; it is less likely to occur with LMWH. HIT should be considered under the following circumstances:

   - Fall in Platelet count of 50% or more from baseline, occurring 4-14 days after heparin commenced (N.B. may occur earlier if patients have received heparin within the past 100 days).
   - Where the patient has been admitted in the past 100 days to hospital assume they have been given heparin.
   - Arterial or Venous Thrombosis occurring while patient on heparin.
   - Acute Systemic reaction to IV bolus of heparin.
   - Skin lesions at heparin injection site.
   - Refer to known patient allergies prior to prescribing.
If HIT is suspected, discuss with clinical Haematology Team at SDHFT to arrange specific laboratory test and arrange for the specific blood collection equipment from the blood bank to be sent to the community hospital. If HIT is strongly suspected or confirmed, the LMWH should be stopped and an alternative anticoagulant should be prescribed after advice from the clinical haematology team.

In patients who require warfarin, ensure that platelet counts return to the normal range before prescribing warfarin.

5. Pregnancy and Breast Feeding
5.1 LMWHs should only be used during pregnancy if the prescriber has established a clear need. This should be under the guidance of the clinical haematology/obstetrics team at the acute trust. Do not use multidose vials in pregnant patients.
5.2 Breast feeding mothers should be advised to avoid LMWHs unless the prescriber establishes a clear need and considers the risk-benefit balance.

6. Drug Interactions
6.1 Drug interactions to consider when prescribing LMWHs include:
   - Possible enhanced anticoagulant effect or increased risk of bleeding with: aspirin, clopidogrel, dipyridamole, glycoprotein IIb/IIIa inhibitors, vitamin K antagonists, thrombolytics, iloprost, NSAIDs, systemic glucocorticoids, cytostatics, dextran, sulfinpyrazone, probenecid, and etacrynic acid.
   - Reduced anticoagulant effect with:
     Intravenous nitrates
   - Increased risk of hyperkalaemia with:
     ACE Inhibitors, aliskirin, angiotensin-II receptor antagonists, potassium-sparing diuretics.
     (Refer to BNF Appendix 1 or Summary of Product Characteristics).

7. Investigations prior to initiating a LMWH
7.1 Before prescribing a LMWH the following should be checked:
   - Full Blood Count (FBC), INR + APTT
   - Urea and electrolytes(U&E)
   - Liver Function Test (LFT’s)
   - For inpatients, transcribe these results onto the drug chart
7.2 Check for history of bleeding risk, acute peptic ulceration symptoms or other contraindications.
7.3 Check if the patient is on medicines that may prolong bleeding time or affect platelet function (e.g. aspirin, non steroidal anti inflammatory drugs, clopidogrel).
7.4 For use in treating a VTE: Weigh patient and record the weight in the medical notes and on the patient medication administration record.
7.5 For use in VTE prophylaxis: Ensure a VTE risk assessment has been completed (for hospital inpatients use the VTE risk assessment section of the Patient Medication and Administration Record).

**NB** Delays in obtaining blood results should not delay initiation of the first dose but every effort must be made to base subsequent dosing on these results.

If a patient is admitted directly to a community hospital on a Friday evening or over a weekend, blood tests may not be taken and reported on until the following Monday. In this situation, an at risk patient should be started on a LMWH if clinically indicated. Every effort should be made to carry out the appropriate blood tests on the next available working day and subsequent dosing should be based on these results. Urgent blood tests may be requested if the prescriber feels this is clinically appropriate.

8. **Dosage and Administration – dalteparin Sodium (Fragmin)**

8.1 Preparations
Dalteparin is supplied as pre-filled syringes of 2,500 units, 5000 units, 7,500 units, 10,000 units, 12,500 units, 15,000 units and 18,000 units.

8.2 Prophylaxis of Venous Thromboembolism
The dose is not weight related and is prescribed at dalteparin 5000 units subcutaneously (SC) once daily.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
</tr>
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<tbody>
<tr>
<td>Medical Patient</td>
<td>5000units SC daily</td>
</tr>
<tr>
<td>Surgical – high risk</td>
<td>5000units SC daily</td>
</tr>
<tr>
<td>Surgical – moderate risk</td>
<td>5000units SC daily</td>
</tr>
<tr>
<td>Surgical – low risk</td>
<td>Not Required.</td>
</tr>
</tbody>
</table>

Dosage reductions are not generally required in renal dysfunction for prophylactic doses. Discuss with haematology department if concerned.

8.3 Treatment of DVT or PE
The dose of dalteparin for the treatment of a thromboembolic event is based on the patient’s body weight and renal function, up to a maximum of 18,000 units per day.

<table>
<thead>
<tr>
<th>Weight (Kg)</th>
<th>Dose</th>
<th>Volume of syringe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 46kg</td>
<td>7,500 units SC daily</td>
<td>0.3ml</td>
</tr>
<tr>
<td>46kg-56kg</td>
<td>10,000 units SC daily</td>
<td>0.4ml</td>
</tr>
<tr>
<td>57kg-68kg</td>
<td>12,500 units SC daily</td>
<td>0.5ml</td>
</tr>
</tbody>
</table>
The patient’s weight must be established in kilograms (kg) at the start of therapy and, where applicable, during treatment. The weight must be accurately recorded on the Patient Medication Administration Record and/or the clinical notes.

Renal function should also be assessed prior to treatment. The renal function test should not delay the first dose of treatment but every effort should be made to base subsequent dosing on these results.

Patients with an e-GFR of <30ml/min/1.73m² will require dose adjustment. In these patients, seek specialist advice from haematology before prescribing dalteparin. If considering the use of UFH, transfer to the acute trust would be necessary.

The dose should be administered at approximately the same time each day.

8.4 Duration of treatment
Prophylaxis
Continue treatment whilst there is a significant reduction in mobility relative to normal state.
Some patients will have a specified duration for prophylaxis (e.g. following a hip replacement) which will be specified on the discharge summary from the acute trust.

Treatment
If oral anticoagulation is started, LMWH treatment should continue for at least 5 days or until oral anticoagulation is established, with an INR in the therapeutic range for two consecutive days.

8.5 Administration
The prefilled syringe is ready for use. Do not expel the air bubble from the syringe before giving the dose. If the syringe does not contain the correct dose, expel excess liquid by holding the needle downwards and measure the dose from the bottom of the air bubble.
Dalteparin should be administered by subcutaneous injection when the patient is lying down. The administration should be alternated between the left and right anterolateral or posterolateral abdominal wall, or into the lateral part of the thigh. The total length of the needle should be introduced vertically, not at an angle, into the thick part of a skin fold, produced by squeezing the skin between thumb and forefinger; the skin fold should be held throughout the injection. Do not rub the injection site after administration.

8.6 Timing of dose
The dose of dalteparin should be administered at approximately the same time each
Following discharge from hospital, the administration time of dalteparin may be moved by a maximum of four hours to facilitate administration at a convenient regular time by community nurses. This is outside the product licence and is a clinical decision. The decision to alter the administration time must be confirmed with the patient’s GP before the dalteparin is administered.

9. Dosage and Administration - Enoxaparin sodium (Clexane®)

9.1 Preparations
Enoxaparin is supplied in prefilled syringes of 20mg, 40mg, 60mg, 80mg, 100mg, 120mg and 150mg.

9.2 Prophylaxis of Venous Thromboembolism
The dose is not weight related and is prescribed at enoxaparin 20mg or 40mg subcutaneously once daily. Refer to local formulary and guidelines for details of risk stratification and dose

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
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</thead>
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<tr>
<td>Medical Patient</td>
<td>40mg SC daily</td>
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<tr>
<td>Surgical – high risk</td>
<td>40mg SC daily</td>
</tr>
<tr>
<td>Surgical – moderate risk</td>
<td>20 mg SC daily</td>
</tr>
<tr>
<td>Surgical – low risk</td>
<td>Not Required.</td>
</tr>
</tbody>
</table>

In severe renal function (eGFR<30ml/min/1.73m2) 20mg SC daily should be given for all medical patients and for moderate and high risk surgical patients.

9.3 Treatment of DVT or PE
Prescribed doses of enoxaparin for the treatment of a thromboembolic event are based on the patient’s body weight and renal function.

The dose prescribed should be **1.5mg/kg** subcutaneously once daily. If eGFR <30ml/min/1.73m2 prescribe **1mg/kg** subcutaneously once daily.
**DOSAGE GUIDE TABLE FOR PATIENTS WITH GFR >30ml/min/1.73m²**

<table>
<thead>
<tr>
<th>Weight (Kg)</th>
<th>Dose</th>
<th>Volume of syringe</th>
<th>Size of syringe</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>60 mg</td>
<td>0.60 ml</td>
<td>60 mg in 0.6 ml Yellow</td>
</tr>
<tr>
<td>45</td>
<td>70 mg</td>
<td>0.70 ml</td>
<td>80 mg in 0.8 ml Red</td>
</tr>
<tr>
<td>50</td>
<td>75 mg</td>
<td>0.75 ml</td>
<td>80 mg in 0.8 ml Red</td>
</tr>
<tr>
<td>55</td>
<td>85 mg</td>
<td>0.85 ml</td>
<td>100 mg in 1 ml Black</td>
</tr>
<tr>
<td>60</td>
<td>90 mg</td>
<td>0.90 ml</td>
<td>100 mg in 1 ml Black</td>
</tr>
<tr>
<td>65</td>
<td>100 mg</td>
<td>1.00 ml</td>
<td>100 mg in 1 ml Black</td>
</tr>
<tr>
<td>70</td>
<td>105 mg</td>
<td>0.70 ml</td>
<td>120 mg in 0.8 ml purple</td>
</tr>
<tr>
<td>75</td>
<td>113 mg</td>
<td>0.75 ml</td>
<td>120 mg in 0.8 ml purple</td>
</tr>
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<td>80</td>
<td>120 mg</td>
<td>0.80 ml</td>
<td>120 mg in 0.8 ml purple</td>
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<td>85</td>
<td>128 mg</td>
<td>0.85 ml</td>
<td>150 mg in 1 ml Blue</td>
</tr>
<tr>
<td>90</td>
<td>135 mg</td>
<td>0.90 ml</td>
<td>150 mg in 1 ml Blue</td>
</tr>
<tr>
<td>95</td>
<td>143 mg</td>
<td>0.95 ml</td>
<td>150 mg in 1 ml Blue</td>
</tr>
<tr>
<td>100</td>
<td>150 mg</td>
<td>1.00 ml</td>
<td>150 mg in 1 ml Blue</td>
</tr>
<tr>
<td>105</td>
<td>160 mg</td>
<td>0.8 ml x120 mg + 0.4 ml x40 mg</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>165 mg</td>
<td>1 ml x100 mg + 0.65 ml x 80 mg</td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>175 mg</td>
<td>1 ml x 100mg + 0.75 ml x 80 mg</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>180 mg</td>
<td>1 ml x 100mg + 0.8 ml x 80 mg</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>190 mg</td>
<td>1 ml x 150 mg + 0.4 ml x 40 mg</td>
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</table>

**NB** Some doses have been rounded for ease of administration.

The patient’s weight must be established in kilograms (kg) at the start of therapy and, where applicable, during treatment. The weight must be accurately recorded on the Patient Medication Administration Record and/or the clinical notes.
Renal function should also be assessed prior to treatment. The renal function test should not delay the first dose of treatment but every effort should be made to base subsequent dosing on these results.

Patients with an e-GFR of <30ml/min/1.73m2 will require dose adjustment. In these patients, seek specialist advice from haematology before prescribing enoxaparin. If considering the use of UFH, transfer to the acute trust would be necessary.

The dose should be administered at approximately the same time each day.

9.4 Duration of treatment
Prophylaxis
Continue treatment whilst there is a significant reduction in mobility relative to normal state. Refer to local formulary and guidelines for further guidance for specific treatment. Some patients will have a specified duration for prophylaxis (e.g. following a hip replacement) which will be specified on the discharge summary from the acute trust.

Treatment
If oral anticoagulation is started, LMWH treatment should continue for at least 5 days and until oral anticoagulation is established, with an INR in the therapeutic range for two consecutive days.

9.5 Administration
The prefilled syringe is ready for use. Do not expel the air bubble from the syringe before giving the dose. If the syringe does not contain the correct dose, expel excess liquid by holding the needle downwards and measure the dose from the bottom of the air bubble.

Enoxaparin should be administered when the patient is lying down by subcutaneous injection. The administration should be alternated between the left and right anterolateral or posterolateral abdominal wall. The total length of the needle should be introduced vertically, not at an angle, into the thick part of a skin fold, produced by squeezing the skin between thumb and forefinger; the skin fold should be held throughout the injection. Do not rub the injection site after administration.

9.6 Timing of dose
The dose of enoxaparin should be administered at approximately the same time each day.
Following discharge from hospital, the administration time of enoxaparin may be moved by a maximum of four hours to facilitate administration at a convenient regular time by community nurses. This is outside the product licence and is a clinical decision. The decision to alter the administration time must be confirmed with the patient’s GP before the of enoxaparin is administered.
10. Monitoring

All patients should have a baseline platelet count prior to starting treatment. This should be repeated every 2-4 days from days 4-14 of treatment. Patients who have received heparin in the last 100 days should have a platelet count 24 hours after starting LMWH.

Other baseline monitoring should include: patient weight, INR, urea and electrolytes, LFTs and FBC.

LMWHs can cause hyperkalaemia. The risk appears to increase with increased duration of therapy. Patients at increased risk include: patients with diabetes mellitus, chronic renal failure, acidosis, raised plasma potassium concentration or those taking potassium sparing drugs (e.g. potassium-sparing diuretics, ACE inhibitors, Angiotensin-II receptor antagonists). Plasma potassium concentration should be monitored in patients at increased risk prior to starting treatment and regularly thereafter, particularly if treatment is to be continued for longer than 7 days.

Routine monitoring or dose adjustment of dalteparin is not required beyond 14 days of prescribing, however there are certain clinical circumstances where monitoring may be considered or specialist advice sought:

- Extremes of weight (very under or overweight)
- Severe Renal failure (eGFR <30 ml/min/1.73m2). Seek advice from haematology team prior to prescribing. If considering use of UFH transfer to acute trust would be required.
- Pregnancy
- High risk of bleeding
- Unexpected bleeding
- Severe liver dysfunction

LMWH can be monitored by anti-factor Xa assay if clinically appropriate. This must be discussed with the Haematology Laboratory in advance.

5ml citrate (blue top) sample, taken 4-6 hours post LMWH injection
Target anti-Xa level 0.7 – 1.0 iu/ml (for treatment dose)

It should be noted that anti-Xa assay appears to have a poor predictive value for bleeding/thrombosis. Monitor Platelet count as discussed above.

11. Management of bleeding

If bleeding occurs stopping the LMWH may be sufficient. Seek medical advice for further management.

If rapid reversal of the effects of the LMWH is required, protamine sulphate is a specific antidote (see BNF). Protamine only partially reverses the effects of LMWHs. LMWHs have a longer half-life than unfractionated heparin therefore the effect of LMWHs will persist for longer.
If severe or life threatening bleeding occurs, transfer urgently by 999 ambulance to acute trust.

12. Transfers of care
At transfer of care the following essential information must be given to ensure that future LMWH doses are safely managed:

- Indication
- LMWH product (e.g. dalteparin or enoxaparin)
- Dose and route
- Duration of treatment
- Weight
- Renal function
- Results of blood tests or any other appropriate investigations
- Advice on dose alterations where appropriate

Transfer of care includes discharge from hospitals or community nursing services and transfer between services (e.g. referral from DVT clinic/Walk-in-Centre to community management).

13. Training
13.1 Staff have access to VTE training via e learning and on site training from hospital matrons

14. References:

<table>
<thead>
<tr>
<th>Reference</th>
<th>Date Accessed</th>
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<tbody>
<tr>
<td>Enoxaparin sodium (Clexane) Product characteristics accessed 13.8.12</td>
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<td>Dalteparin sodium (Fragmin) Product characteristics accessed 13.8.12</td>
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<tr>
<td>NICE Clinical Guideline 92 - Venous thromboembolism: reducing the risk 2010</td>
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<tr>
<td>British Committee for the standards in haematology Guidelines on the use and monitoring of heparin (2006)</td>
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BNF 63  March 2012
Clinical Guideline for the use and monitoring of Low molecular Weighth Heparins (LMWHs) in community hospitals and community setting NHS Devon provider services ( January 2011)

Amendment History

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