INTRODUCTION

This protocol aims to promote the effective management of patients prescribed low molecular weight heparins (LMWHs) in the community, highlighting potential risks to nursing staff and patients and enabling nurses to check the prescribed doses of LMWHs are appropriate for the patients in their care. The recommended change in practice is a result of the National Patient Safety Alert RRR014 Reducing treatment dose errors with low molecular weight heparins (July 2010).

Prescribed doses of LMWHs for the prophylaxis and treatment of thromboembolic events are dependent on the weight and renal function of the patient. Correct dosing is important because, under dosing has an increased risk of a further thromboembolic event, while overdosing can increase the risk of bleeding.

TARGET GROUP

All registered nurses employed by Wirral Community NHS Trust who are involved in the care and treatment of patients prescribed LMWHs as outlined in their job description.

TRAINING

All staff must attend Medicines Management Training every two years
All staff must have completed the Medicines Management Competency within three months of joining the organisation

SIGNIFICANT RISK FACTORS FOR ADMINISTRATION OF LOW MOLECULAR WEIGHT HEPARINS IN THE COMMUNITY

Dosing errors with LMWHs can occur when:
- The prescribed treatment dose is not calculated using the patient’s current weight
- Renal function is not considered
- The prescribed dose and frequency are outside accepted guidelines
- The volume to be administered of LMWH is incorrectly calculated
In the case of Tinzaparin, the wrong preparation could be selected, as there are two strengths of Tinzaparin available: 20,000 units/ml for treatment of thromboembolic events and Tinzaparin 10,000 units/ml for prophylaxis of thromboembolic events.

**ESSENTIAL INFORMATION**

In addition to the essential information that must be available for community nurses to administer any medicine, for the administration of LMWHs the following information also needs to be available:
- Patient's weight
- Renal function
- Indication
- Duration of treatment

Wirral University Teaching Hospital and other secondary care providers also will be complying with Rapid Response Report: NPSA/2010/RRR014. Reducing treatment dose errors with low molecular weight heparins (July 2010)

**PATIENT'S WEIGHT**

- A patient’s weight is used as the basis for calculating the required dose of LMWH.
- Patients should be weighed before the start of treatment with calibrated scales (checked every six months) that read zero prior to patient standing on them. Weigh the person in light clothes and without shoes.
- The weight of the patient should be accurately recorded in kilograms (kg) on the Patient Medicines Administration Chart (PMAC) by the prescriber.
- If the prescriber has not already done so, the community nurse must record the patient’s weight in kilograms on the PMAC, if the nurse has to record the weight, document name, date and designation and an incident form must be completed
- The weight should be rechecked every 6 weeks for patients who continue treatment with LMWHs or earlier if clinically indicated.
- Nursing staff must be aware of patients who rapidly lose or gain weight and reweigh as appropriate.
- When patients are unable to stand or are confined to bed, the use of hoists with weighing scales are available from the Community Equipment Store.

If patient is bed bound and the nurse is unable to weigh the patient, follow the guidelines below based on Malnutrition Universal Screening Tool (MUST). The result obtained is an estimation of weight and not fully accurate, however is based on current best practice for the limited situations where it is not possible to obtain an accurate weight via calibrated scales. Only use this system of estimating weight, if there is no possibility of weighing the patient

**Steps to follow:**

1. Obtain Mid Upper Arm Circumference (MUAC) in cm
2. Use equations to estimate BMI:
   a. **Men**: $BMI = 1.01 \times MUAC - 4.7$
   b. **Women**: $BMI = 1.10 \times MUAC - 6.7$

3. When BMI is estimated, use the following calculation to obtain the estimated weight:

   $$Weight\ (kg) = BMI\ (kg/m^2) \times height^2\ (m)$$

4. If you do not have the height, then use the Ulna Length measurement to estimate it, as per Malnutrition Universal Screening Tool (MUST)

**Measuring Ulna Length**

- Ask patient to bend an arm (left side if possible) palm across chest, fingers pointing to opposite shoulder
- Using a tape measure, measure the length in centimeters (cm) between the point of the elbow (olecranon) and the mid-point of the prominent bone of the wrist (styloid process)
- Use table appendix 3 to convert ulna length (cm) to height (m) and document

*Example given:*
Patient: elderly woman (over 65 years), unable to be weighed, MUAC measured at 21cm. Ulna length is 22cm, therefore using MUST see appendix 3, height is estimated at 1.52m

Estimated BMI = (1.10 x 21) – 6.7 = 16.4

Estimated Weight = 16.4 x (1.52^2) = 16.4 x 2.3104 = 37.9kg

**RENAL FUNCTION**

- Renal function should be checked before starting treatment with LMWHs and then at appropriate intervals, if continuing on LMWH (i.e. routinely every 3 months or sooner if the patient’s condition changes in a way that might affect renal function). It is the prescriber’s responsibility to monitor renal function.
- An approximate creatinine clearance can be calculated using the Cockcroft and Gault Formula which can be found in the current BNF, the formula is as outlined below:

  **Cockcroft and Gault Formula for Estimated Creatinine Clearance**

  Estimated Creatinine Clearance ml/minute = \(\frac{(140-\text{Age}) \times \text{Weight} \times \text{Constant}}{\text{Serum creatinine}}\)

  *Age in years*
  *Weight in kilograms: use ideal body weight (unless the patient is underweight)*
  *Serum creatinine in micromol/litre*
  *Constant= 1.23 for men; 1.04 for women*
CAUTIONS

- Patients whose creatinine clearance is less than 20ml/min should not be prescribed Tinzaparin 20,000 units/ml for the treatment of thromboembolic events.

- When Tinzaparin 20,000 units/ml is prescribed, the patient needs to have a creatinine clearance of 20ml/min or above, this is the responsibility of the prescriber. This information should be communicated on discharge routinely to the GP by secondary care. If there is any suspicion of renal impairment, nursing staff should only administer Tinzaparin where creatinine clearance is documented and is 20ml/min or over.

INDICATION

It is essential that nurses know the reason why the patient is prescribed a LMWH. This information should be communicated routinely by secondary care. Each LMWH will have specific licensed indications. The Wirral health economy have rationalised the range of LMWHs for specific indications, different indications will therefore require different LMWHs; also different indications require different doses.

DURATION OF TREATMENT

It is essential that nurses know the expected duration of treatment. This information should be communicated routinely by secondary care. By nurses knowing the expected duration of treatment, the likelihood of patients taking LMWHs for too long or too short a time, will be reduced.

DOSING CHECKS

When all essential information is available, community nurses need to check the:-
- Prescribed dose of LMWH
- Duration of treatment
- For Tinzaparin preparations, the correct preparation has been supplied for the indication, for example Tinzaparin 10,000 units/ ml is licensed for the prophylaxis of thromboembolic events and Tinzaparin 20,000 units/ ml is licensed to treat thromboembolic events

Registered nurses are required to “know the therapeutic uses of the medicine to be administered, its normal dosage, side effects, precautions and contra-indications (NMC 2010). Medicines information is available in the package insert, the current BNF and in the specific product characteristics (SPC) for each LMWH. The SPC is available from www.medicines.org.uk. Information and advice is also available from Medicines Information Service Tel 0151 643 5338 or internally on Ext 1026. See also appendix 2 of this document for a dose calculation tool for use for patients prescribed tinzaparin 20,000 units/ml for thromboembolic events.
MONITORING

- As there is a risk of antibody-mediated heparin induced thrombocytopenia, platelet counts should be measured in patients receiving heparin for longer than 5 days and the treatment should be stopped immediately in those patients who develop thrombocytopenia.
- There is a risk of heparin induced hyperkalaemia which appears to increase with duration of therapy, plasma potassium should be measured in patients at risk, before the start of therapy and for patients receiving heparin treatment for longer than 7 days.
- Patients receiving long term LMWHs should have their platelet counts and potassium levels monitored 3 monthly or sooner if clinically indicated.
- It is the responsibility of the prescriber to monitor the patient

TREATMENT CHOICE

The Wirral Medicines Guide supports prescribers in both primary and secondary care. Analysis of Prescribing Data between August 2009 and September 2010 showed only tinzaparin, enoxaparin and dalteparin were prescribed in Wirral. See appendix 1 for the specific products that were prescribed.

Tinzaparin (Innohep)
Tinzaparin 20,000 units /ml (to treat thromboembolic events)

- Whenever tinzaparin is prescribed, check the strength supplied is correct.
- The most commonly prescribed LMWH in Wirral is Tinzaparin 20,000 units/ml available as; 0.5ml, 0.7ml and 0.9ml prefilled syringes. These prefilled syringes of tinzaparin are licensed to treat thromboembolic events.
- The licensed treatment dose is 175 units/kg subcutaneous injection once daily, until oral anticoagulation is established (see appendix 1 for dosing chart). This standard dosage can be used in patients with creatinine clearance levels of 20ml/min or above.
- Tinzaparin 20,000 units/ml must be administered to the nearest 1000 units using the prefilled syringes

SPECIAL CARE:-

- Community nurses may also come across Tinzaparin vials 20,000 units/ml in 2ml vials, special care is needed when these vials are prescribed, as the potential for dosing errors is greater. Refer to the product insert or SPC for information on stability data for this product.
Tinzaparin 10,000 units/ml (for prophylaxis of thromboembolic events)

- Great care must be taken to check the strength of tinzaparin supplied. This is because tinzaparin 10,000 units/ml should only be administered for prophylaxis of thromboembolic events. Tinzaparin 10,000 units/ml is now the Wirral Medicines Guide choice for prophylaxis of thromboembolic events, however it is anticipated that most LMWHs in the community will be for treatment and not prophylaxis of thromboembolic events.
- If a prescriber chooses 10,000 units/ml tinzaparin the nurse must check that this strength was intended and be able to satisfy themselves that the dose is appropriate. It may therefore be necessary for the nurse to check the SPC or contact Medicines Information Service on 0151 643 5338 or internally on ext 1026. The SPC is available electronically via the Electronic Medicines Compendium www.medicines.org.uk, any clinical incident or near misses must be reported using the Trust incident reporting system
- For the treatment or prophylaxis of thromboembolic disease in obstetrics using tinzaparin, patients will be treated by secondary care. Specialist protocols are available from Women’s service-Duchess of Westminster Wing. In the unlikely event of community nurses being involved in the administration of LMWHs for this indication, advice on dosing and product information is available from the Medicines Management Team 0151 643 5338

Enoxaparin (Clexane)

For patients whose creatinine clearance is less than 20ml/min
- Enoxaparin is the Wirral Medicines Guide LMWH of choice for treatment of thromboembolic events in patients whose creatinine clearance is less than 20ml/min.
- The treatment dose is enoxaparin 1mg/kg by subcutaneous injection once daily
- Refer to the current Wirral Medicines Guide for details of other indications and dosages for which Enoxaparin is recommended.

Dalteparin (Fragmin)

- Dalteparin is not recommended by the current Wirral Medicines Guide, however there has been a small, but significant number of patients prescribed dalteparin.
- This maybe because dalteparin is licensed for the extended treatment and prophylaxis of venous thromboembolism in patients with solid tumours.
- Dalteparin has therefore been prescribed for patients discharged from Clatterbridge Centre for Oncology.
- Refer to the SPC for dosing information on dalteparin. The SPC is available electronically via the Electronic Medicines Compendium www.medicines.org.uk
- The SPC outlines dosage adjustment in renal impairment and thrombocytopenia (low platelets) due to chemotherapy.
- Advice on dosing and product information is available from the Medicines Information Service 0151 643 5338 or internally on ext 1026.
ADMINISTRATION OF TINZAPARIN –

Tinzaparin preparations are available in prefilled syringes and vials. During the filling of the prefilled syringes, a small air bubble - 5 mm - is included in all syringes to facilitate control of filling.

- Remember Tinzaparin 20,000 units/ml is licensed to treat thromboembolic events

If administering the full dose of Tinzaparin 20,000 units/ml, from 0.5, 0.7 or 0.9ml pre filled syringe, there is a small overage, therefore the air bubble should be expelled first and then the excess. The air bubble and excess will also be expelled if only part of the syringe is administered.

- Remember Tinzaparin 10,000 units/ml is licensed for the prophylaxis of thromboembolic events

If you are using the full dose of Tinzaparin 10,000 units/ml, from a 0.25ml, 0.35ml or 0.45ml prefilled syringe do not expel the air bubble, as injection of the small air bubble by subcutaneous injection is quite harmless.

CAUTION

The manufacturer’s packaging for LMWHs will state the number of units in 1ml as well as the number of units in the volume of the syringes. For example Tinzaparin 0.9ml prefilled syringes contain 18,000 units in 0.9ml, but the strength on the manufacturer’s box also states the volume in one ml i.e. Tinzaparin 20,000 units in 1ml.

CHANGING THE TIMING OF LMWH ADMINISTRATION

LMWHs should all be administered at the same time each day to reduce any risks of over or under dosing. A window of + or – 2 hours around the administration time is considered acceptable on an occasional basis without risking over or under dosing. There will however be situations when the first dose is administered at a time that is inconvenient for future injections, the decision to change dosing times are at the discretion of the prescriber and will be outside the terms of the product license. However, the manufacturers of both tinzaparin and enoxaparin have suggested that providing the “new” time of administration is greater than 12 hours after the last dose, a full dose should be administered. Any subsequent dosing should be at the “new” time.

INCIDENT REPORTING

Clinical incidents or near misses must be reported and an Incident Form must be completed i.e. if a wrong dose is given, if there is insufficient patient information on discharge, or a patient visit has been omitted.
MISSED VISITS

Ascertain when patient last received their LMWH injection
Inform patient /carer that a nurse will visit immediately
Document advice in patient’s health records
Check in the patient home records that LMWH has not been administered
Contact General Practitioner (GP) or GP out of hours to inform GP of missed visit
Inform line manager within the same working shift and complete an incident form.

FAILED VISITS

If a nurse fails to gain access to a patient’s home, the nurse would need to consider the following options:
An appointment time had been agreed with the patient
Check with senior nurse that the patient has not cancelled the visit

If a nurse is unable to establish contact with the patient
Follow policy for “Failure to gain access for adults and children”
Complete an incident form and inform manager

HOW PROTOCOL WILL BE MEASURED THAT IT IS BEING ACHIEVED

- Health records will demonstrate a current care plan, with evidence of valid consent and re-assessment of patients needs as required
- Health records will evidence partnership working with the patient to best manage their condition
- Health records will evidence partnership working with the referring clinician, and updates on patient’s progress as required
- Health records will demonstrate all correct administration of medicines forms

REFERENCES

British National Formulary (BNF) www.bnf.org

Malnutrition Universal Screening Tool (MUST)
http://www.bapen.org.uk/pdfs/must/must_full.pdf

Electronic Medicines Compendium www.medicines.org.uk

http://www.clinicalnutritionjournal.com/article/S0261-5614(03)00009-8/abstract

CONSULTATION AND ADVICE FROM:

- Medicines Management Group
- Medicines Management Team
- Quality and Governance Group
- Dietetic Service
- DVT Team

Appendix 1

Analysis of Wirral prescribing data between September 2009 and August 2010 showed the following LMWHs were prescribed in Wirral:

Enoxaparin (Clexane) 100mg/ml 0.2ml, 0.4ml, 0.6ml, 0.8ml and 1ml prefilled syringes
Enoxaparin (Clexane) 100mg/ml 3ml vial
Enoxaparin (Clexane) 150mg/ml 0.8ml and 1ml prefilled syringes

Dalteparin sodium (Fragmin) 12,500 units/ml 0.2ml prefilled syringes
Dalteparin sodium (Fragmin) 25,000 units/ml 0.2ml, 0.3ml, 0.4ml, 0.5ml, 0.6ml, 0.72ml prefilled syringes

Tinzaparin sodium (Innohep) 10,000 units/ml 0.25ml, 0.35ml, 0.45ml prefilled syringes
Tinzaparin sodium (Innohep) 10,000 units/ml 2ml vial (NOTE: this will be 20,000 units/2ml)

Tinzaparin sodium (Innohep) 20,000 units/ml 0.5ml, 0.7ml, 0.9ml
Tinzaparin sodium (Innohep) 20,000 units/ml 2ml vial (NOTE: this will be 40,000 units/2ml)
## TREATMENT OF THROMBOEMBOLIC EVENTS

**Dose Calculation Tool for Tinzaparin 20,000 unit/ml for the Treatment of Thromboembolic Events**

Table to calculate dose of Tinzaparin according to patients’ weight (175 units/kg)

<table>
<thead>
<tr>
<th>Product to be prescribed</th>
<th>BODY WEIGHT Stones/pounds</th>
<th>BODY WEIGHT Kilograms</th>
<th>INJECTION VOLUME (ml)</th>
<th>PRESCRIBED DOSE Anti-factor Xa IU</th>
</tr>
</thead>
<tbody>
<tr>
<td>The required volume from a 0.5ml syringe</td>
<td>6/4</td>
<td>40</td>
<td>0.35</td>
<td>7,000</td>
</tr>
<tr>
<td></td>
<td>7/1</td>
<td>45</td>
<td>0.4</td>
<td>8,000</td>
</tr>
<tr>
<td></td>
<td>7/12</td>
<td>50</td>
<td>0.45</td>
<td>9,000</td>
</tr>
<tr>
<td></td>
<td>8/9</td>
<td>55</td>
<td>0.5</td>
<td>10,000</td>
</tr>
<tr>
<td>The required volume from a 0.7ml syringe</td>
<td>9/6</td>
<td>60</td>
<td>0.55</td>
<td>11,000</td>
</tr>
<tr>
<td></td>
<td>10/3</td>
<td>65</td>
<td>0.55</td>
<td>11,000</td>
</tr>
<tr>
<td></td>
<td>11/0</td>
<td>70</td>
<td>0.6</td>
<td>12,000</td>
</tr>
<tr>
<td></td>
<td>11/11</td>
<td>75</td>
<td>0.65</td>
<td>13,000</td>
</tr>
<tr>
<td></td>
<td>12/8</td>
<td>80</td>
<td>0.7</td>
<td>14,000</td>
</tr>
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<td>0.75</td>
<td>15,000</td>
</tr>
<tr>
<td></td>
<td>14/2</td>
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<td>0.8</td>
<td>16,000</td>
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<td>0.85</td>
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<td>15/10</td>
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<td>16/7</td>
<td>105</td>
<td>0.9</td>
<td>18,000</td>
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<td>The required volume from a multi-dose 2ml vial which is 20,000 units per 1ml (40,000 units per 2ml)</td>
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<td>0.95</td>
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<td></td>
<td>18/1</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>19/9</td>
<td>125</td>
<td>1.1</td>
<td>22,000</td>
</tr>
</tbody>
</table>

**TINZAPARIN** Dose rounded to the nearest 0.05ml / 1000 units

Chart produced by Lisa Knight. Medicines Management Governance Pharmacist
### Malnutrition Universal Screening Tool (MUST)

http://www.bapen.org.uk/pdfs/must/must_full.pdf

<table>
<thead>
<tr>
<th>Estimating height from ulna length</th>
<th>Men (&lt;65 years)</th>
<th>Men (&gt;65 years)</th>
<th>Women (&lt;65 years)</th>
<th>Women (&gt;65 years)</th>
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<tr>
<td>Height (cm)</td>
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<td>Men (&gt;65 years)</td>
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<tr>
<td>Women (&gt;65 years)</td>
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<td>Ulna length (cm)</td>
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