National Patient Safety Agency

Rapid Response Report: NPSA/2010/RRR014:
Reducing treatment dose errors with low molecular weight heparins

July 2010

Supporting information

Contents

1. Background*

Low molecular weight heparins (LMWHs) are used in the prevention and treatment of venous thromboembolism (VTE) and treatment of acute coronary syndromes. These medicines are given parenterally by intraveneous or subcutaneous injection[1].

In the UK, LMWHs are considered the treatment of choice as they offer many advantages over regular unfractionated heparin.[1,2] They are seen as effective, with a low risk of heparin-induced thrombocytopaenia. Routine monitoring of anti-Factor Xa (anti-Xa) activity is not usually required during treatment with LMWHs, although it may be necessary in patients at increased risk of bleeding, such as those with renal impairment and those who are underweight or overweight. Patients can potentially be discharged home with the medicine because of its long duration of action and subcutaneous administration, thereby shortening their stay in hospital[1,3].

When used for the prevention (prophylaxis) of VTE, a standard dosing regimen is used, however, when used for the treatment of a thromboembolic event the dose is dependent on the weight of the patient[1]. Treatment dose regimens are also dependent on the clinical indication for therapy[1] – underdosing can lead to an increased risk of a further thromboembolic event, while overdosing can increase the risk of bleeding, leading to serious consequences for the patient.

A review of incident reports from three large patient safety reporting programmes in the United States of America suggests that a mean of 3.6 per cent of all medication-error reported incidents involved heparin and low molecular weight heparin products[4].

An observational study in 2007[5] which looked at 10,687 patients, identified that almost half the patients treated with enoxaparin did not receive a recommended dose. Out of the 10,687 patients, 2,002 (18.7 per cent) received an excess dose and 3,116 patients (29.2 per cent) received a lower than recommended dose of enoxaparin. The use of an excess enoxaparin dose was associated with an increased risk of death or bleed especially amongst vulnerable populations (e.g. pregnant women) or patients with limited renal function.

Excess dose was significantly associated with major bleeding (odds ratio, 1.43;95 per cent confidence interval [CI], 1.18-1.75) and death (odds ratio, 1.35; 95 per cent CI, 1.03-1.77) compared with a recommended dose[5].

Analysis of data from the National Reporting and Learning System (NRLS) has shown that there is evidence of harm from patient safety incidents relating to dosing errors with LMWHs (see section 3).

The guidance in the Rapid Response Report and supporting information aims to address a number of the main concerns involved in treatment dosing with LMWHs.

2. Scope

The recommendations in this RRR relate to all healthcare sectors and specialties where the prescribing, administration, monitoring and dispensing of treatment doses of LMWH occur. More treatment doses are now given in the community making this relevant to a range of staff and settings, including GPs, community pharmacies and care homes.

Products involved include all LMWHs used to treat thromboembolic events, such as:

- daltaparin (Fragmin®);
- enoxaparin (Clexane®);

* Initial literature search using the Medline and Embase databases was conducted in February 2010

- tinzaparin (Innohep®); and
- bemiparin (Zibor®).

The use of LMWHs in paediatrics and neonates is outside the scope of the RRR.

LMWH products are currently not licensed for use in children and dosing may require specialist advice. All organisations dealing with children who require LMWHs should have their own evidence-based protocols or be in close liaison with their tertiary paediatric haematology centre for advice about anticoagulation.

Patient weight

Dosing errors with LMWHs can occur if the prescribed treatment dose is not calculated using the patient's current weight. Reports to the NRLS indicate that some patients are not weighed prior to dosing, that body weight is estimated or recorded inaccurately, or that doses based on a patient's weight are miscalculated.

North Wales NHS Trust, which participated in the '1000 Lives Campaign' in 2009, reviewed 'All Wales Pharmacy Intervention data' and identified that enoxaparin was the third most common medication intervention by clinical pharmacists across Welsh hospitals. Local application of a Failure Modes and Effects Analysis (a prospective risk assessment method) looking at dosing issues with LMWHs was then conducted. Their results identified the top three risk areas as:

- failure to weigh patients accurately (49 per cent of patients did not have their weight recorded);
- failure to identify the clinical need for initiating treatment (34 per cent of patients received the wrong initial dose);
- failure to calculate doses accurately and absence of checking by pharmacists.

An Australian study[6] examining the relationship between failure to weigh patients prescribed renally excreted drugs and adverse drug events, found that only 28 per cent of patients on the orthopaedic ward, and just 22 per cent of patients on the medical ward were weighed. Of those patients who were prescribed therapeutic doses of renally excreted drugs, 25 per cent of patients on the orthopaedic ward and 27 per cent on the medical ward were weighed. Importantly, the study revealed that for patients prescribed therapeutic anticoagulation, the failure to obtain their weight was associated with increased prevalence of haemorrhagic complications.

A Canadian study to identify the source of body weight used to determine doses of enoxaparin and other weight dependent medicines for patients with acute coronary syndrome admitted to hospital found a wide discrepancy between patients' stated and actual weights. Their findings report that interventions were required in 21 per cent of the patients because of weight inaccuracies[7].

Older people living in the community with unavailable weight data appear to be more likely to have a high risk of mortality and hospitalisation[8]. Findings in the literature show healthcare professionals inaccurately calculate a patient's weight when visually estimated rather than measured[9,10,11,12].

In March 2010 the Department of Health issued an updated Estates Alert, *Medical patient weighing scales*[13]. This Alert requires NHS organisations to take action to ensure healthcare professionals have access to accurate scales used for weighing patients in relation to medication, treatment or diagnosis. In addition, the equipment should be of the Class III type, and should be regularly maintained and correctly calibrated.

Further information is available at:
www.dh.gov.uk/en/Publicationsandstatistics/Lettersandcirculars/Estatesalerts/DH_114046

The patient's weight should be used as the basis for calculating the required treatment dose of LMWH. The patient's weight must be accurately recorded in kilograms (kg) in the inpatient medication chart (when in use) and the clinical record. Patients should be weighed at the start of therapy and, where applicable, during treatment.

When patients are unable to stand or are confined to their beds, equipment such as hoists with weighing scales or under-bed weighing systems are available to measure their weight accurately.

In exceptional circumstances, when a patient cannot be weighed, obtaining body weight information from patients (or carers) has been shown to be a more reliable source of information than estimates by healthcare staff[14,15,16,17]. The use of weight estimation tools, e.g. formulae utilising knee height and mid-arm circumference, have also been demonstrated to provide more accurate body weight information than estimates by healthcare professionals[13,17,18,19].

Patients who are morbidly obese (BMI>40 kg/m^2) may be considered for anti-Xa levels monitoring and treatment dose adjustments[20].

Renal function

The risks of adverse effects (i.e. bleeding) from LMWHs is significantly increased in patients with renal impairment[1,2].

Not considering renal function was the leading cause of error resulting in serious medication incidents involving LMWHs, in patient safety reporting programmes in the USA[4]. Similarly, incident reports to the NRLS also indicate that patients' renal function is not often taken into consideration when prescribing treatment doses of LMWHs.

As these medicines are renally cleared, LMWHs must be used with caution in subjects with renal failure and may require careful assessment for potential bleeding risks and observation for signs and symptoms of bleeding[2, 20]. Monitoring of anti-Xa levels may be required to detect unacceptably high anticoagulant levels[1,2]. Dosing adjustments or use of an alternative product such as unfractionated heparin should be considered in patients who are renally impaired[1,2,20,21].

Clinical evidence-based sources, such as the British National Formulary (BNF) or each LMWH's summary of product characteristics (SPC), should be consulted for guidelines on dosing in patients with renal impairment. A system for referral (i.e. to local haematology centres) may be considered as part of locally developed guidelines.

Dose regimens based on clinical indication

Current clinical guidelines recommend the use of LWMHs for treatment of deep vein thrombosis, pulmonary embolism, myocardial infarction, and unstable coronary artery disease[1]. Each of these clinical indications differs in their recommended treatment dose and frequency.

However, reports to the NRLS indicate that patients are frequently prescribed, dispensed or administered doses of LMWHs outside the recommended guidelines for the specific clinical indication of therapy (see section 3). A review of the free text narratives of reports suggests that lack of patient information (i.e. clinical indication, weight, renal function, etc.) was not known or considered prior to prescribing LMWHs. Similarly, analysis of prescribing error incidents of heparin and LMWH products, from patient safety reporting programmes in the

USA shows that missing or unused patient information (i.e. diagnosis, laboratory results, weight) contributed to many of the incidents reported[4].

Clinical evidence-based sources, such as the BNF or each LMWH summary of product characteristics (SPC), should be consulted for current dosing guidelines.

A number of trusts have implemented strategies that include the use of practical dosing calculation tools to reduce calculation errors with LMWHs. These have been incorporated in medication charts, policies, posters and other readily available formats. Recommended design features and examples are provided in the appendix.

3. Review of evidence of harm

Incident data from the NRLS†

The NRLS was searched for medication incidents reported as wrong/unclear dose or strength, wrong frequency or wrong quantity; which contained the words 'LMWH', 'Low molecular weight heparin', 'clexane', 'fragmin', 'dalteparin', 'enoxaparin', 'innohep', 'tinzaparin', 'bemiparin',' zibor' in any of the free text fields. There were 2,716 incidents reported to the NPSA from 1 January 2005 to 1 September 2009.

Table 1 Clinical outcomes of dosing incident reports involving LMWHs

Degree of Harm	Frequency	Percentage
Death	1	<1
Severe	3	<1
Moderate	85	3
Low	345	13
No Harm	2282	84
Total	**2716**	**100%**

Table 2 LMWH incidents by stage of medication process

Medication Process	Frequency	Percentage
Administration/supply of a medicine from a clinical area	1734	64
Prescribing	687	25
Preparation of medicines in all locations / dispensing in a pharmacy	160	6
Other	57	2
Monitoring/follow-up of medicine use	57	2
Advice	15	1
Supply or use of over-the-counter (OTC) medicine	6	<1
Total	**2716**	**100%**

† The NRLS was established to provide a national database of incidents relating to patient risks and harm. Interpretation of data from the NRLS should be undertaken with caution. As with any voluntary reporting system, the data are subject to bias. Many incidents are not reported, and those which are may be incomplete, having been reported before the patient outcome is known. Potential harm is often confused with actual harm. A clinical review of reported deaths and severe harm incidents was undertaken to assess if harm was correctly reported. Where incident details provide sufficient evidence, the degree of harm was regraded. The initial search of the NRLS was conducted on 4 December 2009.

Themes

The main themes identified from a review of a sample of free text narratives of NRLS incident reports include:

- dosing errors due to weighing;
- inappropriate prescribing of dose and frequency;
- calculation errors;
- inappropriate treatment dose prescribed for vulnerable patients (e.g. the elderly or patients with limited renal function);
- inappropriate duration of treatment and lack of follow up (e.g. post discharge from hospital).

Example incidents

1. *Patient was prescribed 15,000 units of Fragmin, but when weighed on admission [date] was only 46kg. Treatment dose for this weight is only 10,000 units, so a 50% overdose was prescribed and administered. Patient subsequently transferred to ICU for respiratory support. Incidental APTT result checked on Intensive Care Unit was 129 seconds (ratio 4.3) and when repeated had risen to 178 seconds (ratio 6). No bleeding was observed so far.*
2. *Patient's weight on yellow Tinzaparin sheet was 65kg. Pt informed sister that the Dr asked her to guess her weight in [ward] but did not actually weigh her. Patient was weighed and her actual weight was 75kg and was having 11,000 units of Tinzaparin instead of 13,000 units.*
3. *Patient had been admitted with acute PVD. Started on therapeutic enoxaparin. When staff reviewing prescription chart on ward, it was noticed that the dose prescribed was 100mg bd. The patient only weighs 54.7kg and has renal impairment (GFR=20ml/min). Hence the dose should have been 55mg once a day (i.e. dose prescribed on the prescription chart was almost four times higher than what it should have been.)*
4. *Patient known to have chronic renal failure. Admitted with unstable angina/myocardial infarction. History of recent upper gastrointestinal bleed. Prescribed Clexane 1mg/1kg BD for acute coronary syndrome. Dose not reduced for renal failure. (Checked by pharmacist 6 days later - on high dose Clexane throughout). Collapsed with acute drop in Haemoglobin. Suspected acute bleeding from gastro intestinal tract - may have been worse because Clexane accumulated. Patient very poorly anyway with "unstable" heart. Transferred to [unit name].*
5. *Client was prescribed Tinzaparin in April, which should have been reviewed and changed to Warfarin following a holiday. Instead the Tinzaparin continued for 5 months in which time the client developed a necrotic sacral wound. Tissue necrosis is a documented side effect to this group of medicines and has not been recognised in this instance. At present it is unknown whether the continued use of the drug without adequate review contributed to her death and thus needs further investigation.*
6. *Patient was being reviewed by pharmacist - discovered that patient had been on a high risk drug without a medical review for an inappropriate duration.*

Data from NHS Litigation Authority (NHSLA)

A search of NHS Litigation Authority (NHSLA) claims from April 1995 to May 2009, resulted in three relevant claims due to dosing errors with LMWHs. There was one claim that death was due to inaccurate dose calculation based on weight: “Miscalculated patient’s weight resulting in incorrect dose of Clexane resulting in death.”

The other two relevant incidents which led to unnecessary pain include an error due to a dose calculation, and an incident where the patient continued to receive medication when the use was no longer indicated.

4. Causes of dosing errors with LMWHs

The following are examples of possible causes and contributory factors that have led to dosing errors with LMWHs:

- Appropriate weighing equipment may not be available in the clinical setting.
- Hoists or under-bed weighing scales may not be available for patients who are bedbound or too ill.
- Weighing scales are broken, unreliable or unavailable.
- Limited staff resources or understanding of responsibilities to be able to undertake weighing patients, especially in patients with poor mobility.
- Systems for the documentation of weight, indication and therapeutic goal for therapy may not be available at the time of prescribing (i.e. design of medication charts).
- Limited staff understanding of weight-based dosing guidelines. The use of the imperial system to measure the patient’s weight instead of metric systems. Dose prescribed using estimated weight.
- Limited knowledge and understanding of different dosing and frequency based on indication of therapy. Variable dosing among LMWH medicines.
- Limited knowledge and understanding of guidelines regarding dosing for vulnerable patients.
- Drug information not readily available.
- Patient information (i.e. weight, renal function etc) not known or considered prior to prescribing.
- Poor calculation skills.
- Understanding the responsibilities of nursing and pharmacy staff regarding dosing and ensuring a safe dose is provided before administration or dispensing of LMWHs.
- Patient information not available, therefore unable to conduct safety checks regarding appropriate doses prescribed.

5. Appendix

Summary of rationale for recommended actions

This table provides a summary of how the incident reports, local policy review, and literature explored above informed our recommended actions.

No	Recommendation	Summary of rationale
1	A patient's weight is used as the basis for calculating the required treatment dose of LMWH. The weight must be accurately recorded in kilograms (kg) in the inpatient medication chart (when in use) and clinical record. Patients should be weighed at the start of therapy and, where applicable, during treatment.	Dosing errors with LMWHs can occur if the prescribed treatment dose is not calculated using the patient's current weight. Reports to the NRLS indicate that some patients are not weighed prior to dosing; that body weight is estimated or recorded inaccurately; or that doses based on the patient's weight are miscalculated. A potential contributory factor is the availability and use of appropriate weighing equipment. It may be necessary to weigh patients during inpatient stay as weight may fluctuate due to a number of clinical reasons. Standard units should be used to avoid confusion.
2	Renal function is considered when prescribing treatment doses of LMWHs. The renal function test should not delay initiation of the first dose but every effort must be made to base subsequent dosing on these results.	The risks of adverse effects (e.g. bleeding) from LMWHs is significantly increased in patients with renal impairment[1,2]. As these medicines are renally cleared, dosage adjustments and monitoring of anti-Xa levels may be required[1]. There is evidence of harm from reports due to a patient's renal function not being taken into consideration when prescribing treatment doses of LMWHs.
3	Dose calculation tools are available for a range of body weights, specific clinical indications and LMWH products, and that consideration is given to rationalising the range of LMWH products used in the organisation.	Calculation errors are frequent in reported incidents with LMWHs. Dosing regimens are weight based and differ for the type of indication and LMWH product. Reports indicate that these variations have led to confusion. The use of readily available dosing tools and rationalising the range of LMWHs available are useful strategies to minimise these risks.
4	Essential information such as dose, weight, renal function, indication and duration of treatment is communicated at transfers of care (e.g. by discharge letters) and used to ensure that future doses are safe.	All healthcare staff involved in the prescribing, dispensing and administration of LMWHs will need to know essential patient information. This will allow them to check dose calculations and have an understanding of intended treatment rationale so that risks of inappropriate dosing are reduced.

5	Dosing checks based on patient information are made by healthcare professionals who review, dispense or administer LMWHs when this information is readily available to them.	All healthcare professionals involved in the prescribing, dispensing and administration of LMWHs will need to know essential patient information. This will allow them to check dose calculations and have an understanding of intended treatment rationale so that risks of inappropriate dosing are reduced. Potentially the same risks can occur in the community. The recommendations apply to pharmacy and nursing staff in the primary care sector involved in the administration and supply of LMWHs.
6	System improvements should be demonstrated through the collection and review of data, such as incident reports, clinical pharmacy interventions, audit or other relevant outcome measures.	It is only by reporting and reviewing data such as incident data and taking action that these risks will be effectively managed over the long term. Clinical intervention data has been shown to be useful as an additional source of data, in particular in near miss incidents.

Suggested compliance checklist

This checklist gives examples of what needs to happen before the Central Alerting System (CAS) can be updated as 'Action Complete'.

No	Recommendation	Suggested evidence of compliance	Compliance Y/N
1	A patient's weight is used as the basis for calculating the required treatment dose of LMWH. The weight must be accurately recorded in kilograms (kg) in the inpatient medication chart (when in use) and clinical record. Patients should be weighed at the start of therapy and, where applicable, during treatment.	• Availability of weighing equipment in all clinical areas as recommended in the Department of Health Estates and Facilities Alert *Medical patient weighing scales.* • Local policies and procedures include the management of weighing equipment as per Department of Health Estates and Facilities Alert *Medical patient weighing scales*. • Local policy and procedures address method of weighing and recording of weight in appropriate documentation i.e. patient's inpatient medicines chart or clinical records. • Record of formal sign-off of the above by an organisational committee.	
2	Renal function is considered when prescribing treatment doses of LMWHs. The renal function test should not delay initiation of the first dose but every effort must be made to base subsequent dosing on these results.	• Local policy and procedures on the renal function monitoring. • Record of local sign off by an organisational committee.	
3	Dose calculation tools are available for a range of body weights, specific clinical indications and LMWH products, and that consideration is given to rationalising the range of LMWH products used in the organisation.	• Dose calculation tools are readily available in clinical areas. • Local policies and procedures on the use of dose calculation tools • Record of formal local sign off of the above by an organisational committee.	

4	Essential information such as dose, weight, renal function, indication and duration of treatment is communicated at transfers of care (e.g. by discharge letters) and used to ensure that future doses are safe.	• Local policies and procedures to include a system for documenting and communicating patient information when patients are discharged into the community or transferred to another clinical setting (e.g. different unit or hospital). • Record of formal sign off by an organisational committee.	
5	Dosing checks based on patient information are made by healthcare professionals who review, dispense or administer LMWHs when this information is readily available to them.	• Local policy and procedure for prescribers to obtain and document patient information to ensure that a safe dose is used. • Local policy and procedure for nursing and pharmacy staff to check patient information (where available) to ensure that a safe dose is dispensed and administered. • Where essential information is not readily available to practitioners, organisations should endeavour to find methods to make this information available in the future. • Record of formal sign off by an organisational committee.	
6	System improvements should be demonstrated through the collection and review of data, such as incident reports, clinical pharmacy interventions, audit or other relevant outcome measures.	• Evaluation plan in place to include review of incident reports, intervention data and/or clinical audit. • Findings and actions from the above presented as agenda items on appropriate organisational committee. • Review date set and approved by relevant governance group (which can be referenced at a later date).	

Other implementation considerations			
A	Communication to healthcare staff about the new procedures for prescribing, dispensing and administering LMWHs.	• Communication plan developed and underway. • Date plan approved by relevant governance group (which can be referenced at a later date).	
B	Incorporate the above actions into staff training and education programmes.	• Date plan approved for training and education programmes.	

Resources and good practice examples

Key design features seen from shared inpatient medication charts, posters and best practice guidelines which promote safety:

- Guidelines with a clear reference to weight in kilograms.
- Inpatient medication charts that have a designated space for recording weight. This may allow staff to record, find and use the weight efficiently[6].
- Dose calculation tables or graphs that clearly differentiate between different indications for treatment.
- Dose calculation tables or graphs that clearly set out required dose by body weight to reduce calculation errors in prescribing.
- Readily available information for prescribers on dose recommendations and where to seek further information for managing patients with limited renal function, and/or who are underweight or overweight.
- Dose tables or graphs that use colour to differentiate between syringe strengths to reduce potential picking error. Match the colour used on the dose table with that of the syringe and packaging.
- Dose tables or graphs that clearly set out the injection volume in the syringe by dose required, to reduce calculation errors in administration.
- Dose calculation tools and guidelines should be readily available to healthcare practitioners at the time of prescribing and administering LMWHs.

Examples of dose calculation tools, extracts of medication charts and guidelines shared by a number of organisations are provided over the following pages.

Discussion forum

The NPSA is keen to encourage a community of interested parties to further share and discuss good practice and interventions to aid in the implementation of this RRR. If you have ideas or interventions that have been successfully implemented in your organisation in reducing treatment dose errors with LMWHs, please visit the discussion thread titled "*Reducing treatment dose errors with LMWH*" on the Patient Safety First medication safety forum www.patientsafetyfirst.nhs.uk.

We would also like to invite you to upload resources such as documents, guidance or good practice you wish to share.

Example 1. Extract from Cambridge University Hospital NHS Foundation Trust's anticoagulant treatment chart

Enoxaparin (Clexane) – For PE and/or DVT Treatment:

Do not measure APTT on admission or during treatment with enoxaparin.
Monitor platelets on day 1 and then every 4 days from day 4 - 14. **Dose 1.5mg/kg ONCE daily by subcutaneous injection.**
Dose should be reduced in renal failure. If GFR < 30ml/min, prescribe 1mg/kg once daily.

Patient's weight .....kg Dose .....mg

Weight (kg)	Dose	Volume of syringe	Syringe size
40	60mg	0.60ml	60mg
45	70mg	0.70ml	80mg
50	75mg	0.75ml	
55	85mg	0.85ml	100mg
60	90mg	0.90ml	
65	100mg	1.00ml	
70	105mg	0.70ml	120mg
75	112.5mg	0.75ml	
80	120mg	0.80ml	
85	127.5mg	0.85ml	150mg
90	135mg	0.90ml	
95	142.5mg	0.95ml	
100	150mg	1.00ml	
105	160mg	0.8ml x 120mg + 0.4ml x 40mg	
110	165mg	1ml x 100mg + 0.65ml x 80mg	
115	175mg	1ml x 100mg + 0.75ml x 80mg	
120	180mg	1ml x 100mg + 0.8ml x 80mg	
125	190mg	1ml x 150mg + 0.4ml x 40mg	

Date	Dose (mg)	Vol of syringe	Dr Sig	Nurse Sig	Time (_ _:_ _)

Enoxaparin (Clexane) – For Acute Coronary Syndrome

Do not measure APTT on admission or during treatment with enoxaparin.
Dose 1mg/kg TWICE a day (every 12 hours by subcutaneous injection).
Dose should be reduced in renal failure. If GFR < 30ml/min, prescribe 1mg/kg once daily.

Patient's weight .....kg Dose .....mg

Enoxaparin Schedule

Bodyweight (kg)	Dose (mg)	Volume	Syringe
40kg	40mg bd	0.40ml	Use 60mg syringe
45kg	45mg bd	0.45ml	
50kg	50mg bd	0.50ml	
55kg	55mg bd	0.55ml	
60kg	60mg bd	0.60ml	
65kg	65mg bd	0.65ml	Use 80mg syringe
70kg	70mg bd	0.70ml	
75kg	75mg bd	0.75ml	
80kg	80mg bd	0.80ml	
85kg	85mg bd	0.85ml	Use 100mg syringe
90kg	90mg bd	0.90ml	
95kg	95mg bd	0.95ml	
100kg	100mg bd	1.00ml	
105kg	105mg bd	0.70ml	Use 120mg syringe
110kg	110mg bd	0.73ml	
115kg	115mg bd	0.77ml	
120kg	120mg bd	0.8ml	
125kg	125mg bd	0.83ml	Use 150mg syringe
130kg	130mg bd	0.87ml	

Enoxaparin Dose – Review after 48 hours

Date	Dose (mg)	Vol (ml)	Doctor's Signature	Nurse Signed	Time

Version 2 27/02/2007 Cambridge University Hospital NHS Foundation Trust Pharmacy ext 3479
Drug Chart Divider

Example 2. Extract from King's College Hospital NHS Foundation Trust's anticoagulant treatment chart

Treatment of DVT/PE without haemodynamic compromise with enoxaparin

- The enoxaparin dose banding below is based on **1.5mg per kg** body weight to be given subcutaneously **ONCE** daily for a **minimum of 5 days** and until the INR is therapeutic. If INR > 3.0 in first 5 days of treatment please consult haematology.

RECORD OF ENOXAPARIN FOR TREATMENT OF DVT or PE

Subcutaneous enoxaparin ONCE DAILY													
		→											
		Dose (mg)	6										
		Start Date / Valid Period	8										
		Signature	12										
			14										
		Pharm	18										
			22										

Body Weight (kg)	Syringe Size
40-47kg	60mg
48-59kg	80mg
60-73kg	100mg
74-88kg	120mg
89-109kg	150mg
110-125kg	180mg*
>125kg	Contact haematology

***180mg syringes are not available therefore use a combination of available syringes as appropriate**

Treatment of UNSTABLE ANGINA with enoxaparin

- Use enoxaparin **1mg per kg TWICE** daily by subcutaneous injection.

RECORD OF ENOXAPARIN FOR TREATMENT OF UNSTABLE ANGINA

Subcutaneous enoxaparin													
		Date →											
		Dose (mg)	6										
		Start Date / Valid Period	8										
		Signature	12										
			14										
		Pharm	18										
			22										

Patient Wt (kg)	Dose (mg)	
40	40mg	BD
45	45mg	BD
50	50mg	BD
55	55mg	BD
60	60mg	BD
65	65mg	BD
70	70mg	BD
75	75mg	BD
80	80mg	BD
85	85mg	BD
90	90mg	BD
95	95mg	BD
100	100mg	BD
105	105mg	BD
110	110mg	BD
115	115mg	BD
120	120mg	BD

Renal impairment- contact haematology for advice regarding patients with CrCl < 30ml/min. Renal failure is a relative contraindication to LMWH therefore unfractionated heparin therapy is usually preferred.

Obese Patients – contact haematology for advice regarding dosing in patients over 120kg

Enoxaparin Monitoring - Platelet count should be checked 5 to 7 days after starting Enoxaparin to exclude Heparin Induced Thrombocytopaenia. Routine anti-factor Xa monitoring is not required except in renal impairment, extremes of body weight and patients at high risk of bleeding. Please contact Haematology for advice.

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