Full Title of Guideline:	2248 - Guideline for the use of enoxaparin in adults for the prevention of thromboembolic events, treatment in adults of deep vein thrombosis/pulmonary embolus (DVT/PE) and subtherapeutic INRs in patients with mechanical heart valves
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Division & Speciality:	Cancer and Associated Specialities (CAS) Clinical Haematology Haemostasis & Thrombosis
Version:	3.1 (interim update November 2023)
Ratified by:	Haemostasis and Thrombosis Service Drugs and Therapeutics Committee VTE committee Cardiac Surgeons Renal Consultants
Scope ***(Target audience, state if Trust wide):***	Trust wide
Review date ***(when this version goes out of date):***	February 2025
Explicit definition of patient group to which it applies ***(e.g. inclusion and exclusion criteria, diagnosis):***	All adult inpatients requiring pharmacological thromboprophylaxis with Enoxaparin, treatment with Enoxaparin for suspected or confirmed DVT/PE, or Enoxaparin whilst INR subtherapeutic for patients on Warfarin and at high risk of thrombosis (eg mechanical heart valves)
Changes from previous version ***(not applicable if this is a new guideline, enter below if extensive):***	Clarified that patients on renal replacement therapy should receive the same dose of thromboprophylaxis as patients with creatinine clearance <15ml/min. Dosing table amended November 2023 for switch to Arovi®
Summary of evidence base this guideline has been created from:	• NICE guideline [NG89] Published date: March 2018 - Venous thromboembolism in over 16s: reducing the risk of hospital-acquired deep vein thrombosis or pulmonary embolism • UKCPA HAT group Q&A 326.2 What doses of thromboprophylaxis are appropriate for adult patients at extremes of body weight? Date prepared June 2015 • East Midlands Thrombosis Committee approval • Mechanical heart valve patients and enoxaparin agreed with Haemostasis & Thrombosis and Cardiac Surgeons May 2018 • Regional Iman statement on medicines of porcine origin May 2017
This guideline has been registered with the trust. However, clinical guidelines are guidelines only. The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician. If in doubt contact a senior colleague or expert. Caution is advised when using guidelines after the review date or outside of the Trust.	

Enoxaparin dosing guideline

Scope - Treatment of Adults with enoxaparin for the following indications:

- **Thromboprophylaxis: prevention of thromboembolic events (VTE) in medical and surgical patients**
- **DVT/PE: suspected or confirmed**
- **Subtherapeutic INRs in patients with mechanical heart valves**

Exclusions:

Pregnancy – see the following guidelines:

Treatment of DVT/PE - see 'Management of thromboembolic events in pregnancy' guideline – http://nuhnet/nuh_documents/Guidelines/Family%20Health/Obstetrics%20and%20Maternity/1096.pdf

Thromboprophylaxis - see 'Guideline on the Management of Thromboprophylaxis in Pregnancy' – http://nuhnet/nuh_documents/Guidelines/Family%20Health/Obstetrics%20and%20Maternity/1758.pdf

Extended Thromboprophylaxis in Surgical Patients
– see separate guideline:
https://nuhp.koha-ptfs.co.uk/cgi-bin/koha/opac-retrieve-file.pl?id=d9380e12abeca6c53d74efb016009ad9

Prescribing guidance:

- Enoxaparin (a low molecular weight heparin) is prescribed according to indication and the patient's weight and renal function.
- A guide to prescribing according to indication, patient's bodyweight and renal function is given in Appendix 1.

  Indication:

  - The indication for enoxaparin should be endorsed on the drug chart under 'additional instructions'.

  Weight:

  - Patient's weight should be measured on admission and the weight documented on the drug chart, on Nervecentre and in the patient's nursing notes
  - If weighing a patient is not possible then a recent weight should be obtained from relevant sources (e.g. GP, patient's relative, nursing home etc). Only if there is no information and it is not practical to weigh the patient should an estimate be made of patient's weight. If this has to be done then this should be documented on the drug chart as 'estimated weight'

Renal impairment:

- Enoxaparin accumulates in renal impairment and the frequency of administration and dose should be reduced accordingly. Check the creatinine clearance (using the Cockcroft/Gault formula calculator available here) before prescribing for any indication (do NOT use eGFR). If creatinine clearance is less than 30ml/min the dose is reduced according to dosing table below.

Thrombocytopenia:

- Pharmacological thromboprophylaxis with Enoxaparin should be reviewed in patients with a platelet count less than 75, as indicated in the VTE risk assessment tool, however this can usually continue whilst platelet count remains above 50, unless there are other factors meaning that the patient is at high risk of bleeding.

- If the platelet count falls below 50, pharmacological thromboprophylaxis may no longer be appropriate as the risk of bleeding increases when the platelet count falls below this threshold, although there are some circumstances where the risk of thrombosis is so high that it's reasonable to continue pharmacological thromboprophylaxis down to lower threshold as long as there isn't any active bleeding.

Monitoring – for all patients:

  - Blood tests to be done – see table 1 below.
  - If platelet count falls by more than 50% consider the possibility of heparin induced thrombocytopenia (HIT) – see separate trust guideline.
  - In patients with existing renal insufficiency, reduced urine output or conditions affecting renal function (i.e. sepsis, poor fluid intake, concomitant nephrotoxics etc), monitor U+Es and creatinine clearance regularly and adjust dose if necessary.

Table 1: Enoxaparin blood test monitoring:

Frequency of monitoring	**Tests to be done**	
	Renal function and electrolytes*	**FBC**
Day 7	✓	✓
Day 14	✓	✓

***** Longer term renal function monitoring should be carried out as the patient would usually be monitored i.e. in line with NICE guidance on Chronic Kidney Disease.

Long term enoxaparin / discharge / transfer information:

- If a patient is being discharged or transferred on enoxaparin then the indication, brand (e.g. Arovi®), dose, frequency, duration, patient weight and creatinine clearance should be recorded on the TTO discharge prescription / transfer information.

- Discharge information should also advise the GP of the need for monitoring as per the Nottinghamshire Area Prescribing Committee prescribing information sheet available at https://www.nottsapc.nhs.uk/media/csipuaei/enoxaparin-info-sheet.pdf or via the formulary www.nottinghamshireformulary.nhs.uk.

Administration guidance:

- Nurses – before administration check the following:
    - Weight, indication and creatinine clearance are documented on the drug chart
    - Dose is correct for patient's weight

Patient acceptability:

- Enoxaparin is porcine intestine heparin-derived and for some faiths, medicines or excipients derived from sources that are forbidden could present a dilemma for patients, carers and healthcare professionals. Individuals with a stated preference to adhere to vegetarian or vegan diets might also prefer to avoid animal-derived medications.

- A statement from regional Imams and Muslim doctors staff group regarding use of enoxaparin (and other porcine derived medicines) in Muslim patients (May 2017) stated:
    - *It will be permissible to use LMWHs despite its porcine source due to the following reasons:*
        - *It is a necessary treatment that can be life savings in some situations*
        - *There is a lack of equally effective and widely available alternatives*.

N.B. If patients decline enoxaparin then the usual recommended alternative would be the synthetic treatment, fondaparinux (dosing for adults is shown in Table 2 below):

Table 2: Fondaparinux dosing guidance:

Indication	**Renal function**	**Weight**		
		<50kg	**50-100kg**	**>100kg**
VTE prevention	Reduce to 1.5mg OD if CrCl 20-50ml/min	2.5mg OD		
ACS	Avoid if CrCl <20ml/min	2.5mg OD		
VTE treatment	Avoid if CrCl <30ml/min	5mg OD	7.5mg OD	10mg OD

Appendix 1: Enoxaparin dosing guideline (adults excluding pregnancy)

See table below for subcutaneous doses according to indication, patient's bodyweight and renal function

- **Some of the doses below are off label and differ from the SPC**
- Enoxaparin is supplied as prefilled syringes and **not all calculated doses will be measurable**. Guidance on measurable doses for Arovi® brand are shown in Appendix 2.

Indication	Renal function	Weight			
		<50kg	**50-100kg**	**100-150kg**	**>150kg**
Thromboprophylaxis	CrCl ≥30ml/min	20mg OD	40mg OD	40mg BD	60mg BD
	CrCl 15-30ml/min	20mg OD	20mg OD	40mg OD	60mg OD
	CrCl <15ml/min or Renal Replacement Therapy	20mg OD[1]			
[1]This is considered generally safe in this patient group, but consider seeking senior/specialist advice if used for prolonged periods and/or the patient is at extremes of weight (anti-Xa monitoring can be considered)					
DVT or PE treatment	CrCl ≥30ml/min	1.5mg/kg OD			1mg/kg BD
	CrCl 15-30ml/min	1mg/kg OD			
	CrCl <15ml/min	Seek specialist advice			
Mechanical Heart Valves if INR low[2]	CrCl ≥30ml/min	1mg/kg BD			
	CrCl 15-30ml/min	1mg/kg OD			
	CrCl <15ml/min	Seek specialist advice			
[2]Mechanical heart valves if INR <1.8 (unless INR range 1.5-2.5 then if <1.5) and continue until INR at least >2					

Appendix 2: Enoxaparin sodium (Arovi®) solution for injection measurable doses (in whole mg)

- For administration of doses < 20mg follow guidance in the Paediatric Nephrology / PICU Pharmacopeia
- Doses > 150mg require a combination of two injections utilising the below measurable single doses.

Enoxaparin sodium (Arovi®) 100mg/mL		
Each 0.025 mL graduation = 2.5 mg enoxaparin		
mg	**Volume (in mL)**	**Syringe - plunger**
20	0.2	20mg - white
22	0.225	60mg - orange
25	0.25	60mg - orange
27	0.275	60mg - orange
30	0.3	60mg - orange
32	0.325	60mg - orange
35	0.35	60mg - orange
37	0.375	60mg - orange
40	0.4	40mg - yellow
42	0.425	60mg - orange
45	0.45	60mg - orange
47	0.475	60mg - orange
50	0.5	60mg - orange
52	0.525	60mg - orange
55	0.55	60mg - orange
57	0.575	60mg - orange
60	0.6	60mg - orange
62	0.625	80mg - brown
65	0.65	80mg - brown
67	0.675	80mg - brown
70	0.7	80mg - brown
72	0.725	80mg - brown
75	0.75	80mg - brown
77	0.775	80mg - brown
80	0.8	80mg - brown
82	0.825	100mg - black
85	0.85	100mg - black
87	0.875	100mg - black
90	0.9	100mg - black
92	0.925	100mg - black
95	0.95	100mg - black
97	0.975	100mg - black
100	1	100mg - black

Enoxaparin sodium (Arovi®) 150mg/mL		
Each 0.02mL graduation = 3mg enoxaparin		
mg	**Volume (in mL)**	**Syringe - plunger**
102	0.68	120mg - purple
105	0.7	120mg - purple
108	0.72	120mg - purple
111	0.74	120mg - purple
114	0.76	120mg - purple
117	0.78	120mg - purple
120	0.8	120mg - purple
123	0.82	150mg – dark blue
126	0.84	150mg – dark blue
129	0.86	150mg – dark blue
132	0.88	150mg – dark blue
135	0.9	150mg – dark blue
138	0.92	150mg – dark blue
141	0.94	150mg – dark blue
144	0.96	150mg – dark blue
147	0.98	150mg – dark blue
150	1	150mg – dark blue

Doses > 150mg will require a combination of two injections utilising measurable single doses shown in the table.

Wherever possible, it is recommended to utilise the least number of mg of enoxaparin to administer the combined dose, to prevent inadvertent overdose.

E.g. a dose of 170mg should be given as 1 x 150mg and 1 x 20mg, rather than 1 x 100mg and 0.7mL from an 80mg syringe.

Equality Impact Assessment Report

1. Name of Policy or Service
Response to external best practice policy

2. Responsible Manager
Owen Bennett (Clinical Quality, Risk and Safety Manager)

3. Name of person Completing EIA
Julian Holmes

4. Date EIA Completed
9.5.19

5. Description and Aims of Policy/Service
This guideline describes the use of enoxaparin in the treatment of suspected and confirmed DVT/PE and sub therapeutic INR's in patients with mechanical heart valves

6. Brief Summary of Research and Relevant Data
Based on NICE, current Trent Cardiac group guidelines and UKCPA HAT group data and consensus opinion for treatment of subtherapeutic INR's in patients with mechanical heart valves

7. Methods and Outcome of Consultation
N/A

8. Results of Initial Screening or Full Equality Impact Assessment:

Equality Group	Assessment of Impact
Age	No Impact Identified
Gender	No Impact Identified
Race	No Impact Identified
Sexual Orientation	No Impact Identified
Religion or belief	Enoxaparin is derived from pigs and thus some patients may refuse treatment on religious or lifestyle grounds
Disability	No Impact Identified
Dignity and Human Rights	No Impact Identified
Working Patterns	No Impact Identified
Social Deprivation	No Impact Identified

9. Decisions and/or Recommendations (including supporting rationale)

From the information contained in the procedure, and following the initial screening, it is my decision that a full assessment is not required at the present time.

10. Equality Action Plan (if required)

N/A

11. Monitoring and Review Arrangements

Review February 2025