Policy category	BC - Best Care		
Best care goals	☒ Safe ☐ Personal ☒ Connected ☒ Effective		
Applies to	National		
Version	**Approval authority**	**Effective from**	**'Review by' date**
2	National Medical Director, WA	5/02/2024	2/02/2027

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1. Rationale

The purpose of this clinical protocol is to provide a guiding framework for Hospital at the Home service Medical Practitioners.

Pre-Procedure/Surgical Intervention Bridging typically involves cessation of Warfarin/Non-Vitamin K antagonist oral anticoagulant (NOAC)/ Direct Oral anticoagulants (DOAC) and commencement of Low Molecular Weight Heparin (LMWH). The advice and guidance in this document is specific to **Enoxaparin** as it is the most commonly used LMWH for bridging.

Please reference local guidelines for other types of LMWH.

2. Scope

The clinical protocol applies nationally for HATH clients **treated with anticoagulants prior to scheduled procedures or surgery and require Enoxaparin bridging peri-operatively due to a high risk of thromboembolism** (see Appendix A).

3. Acceptance to HATH criteria and pathway

RED Unsuitable for community admission to HATH. Refer to ED/ Inpatient management. (May become suitable for HATH after ED or inpatient stabilisation).	• Co-existing medical conditions requiring hospital admission • Known or suspected hypersensitivity to Heparins e.g. LMWH or Unfractionated Heparin (unless under the governance of Haematology Consultant or Thrombosis clinic) • Severe thrombocytopenia i.e. Platelets ≤ 50 $x10^9$/L (unless under Haematology Governance)
ORANGE Requires discussion with Medical Governance prior to acceptance.	• Over 13 years, suitable for adult dosing and under the care of a specialist team • Thrombocytopenia where platelets >50 $x10^9$/L • Weight >150kg. Enoxaparin dose needs confirming with specialist/Haematology in this scenario • Weight <50kg. Enoxaparin dose needs confirming with specialist/Haematology in this scenario

	• Renal impairment, eGFR (CG) < 30 ml/min • Pregnancy. Enoxaparin dosing needs confirming with Haematology or Specialist Obstetric Physician
GREEN Accepted for HATH.	• Client referred for Enoxaparin bridging post cessation of oral anticoagulation (Warfarin/NOAC/DOAC) pre-procedure/surgical intervention. • Procedure date must be known • Client's medical condition has been assessed as stable, has a clear diagnosis, management plan, prognosis and is at low risk of deterioration.

4. Pathology

Verify and review the required pathology (via referral documentation or referral source):

- Baseline blood tests:
- Full blood count (FBC) for baseline platelet counts
- Urea & electrolytes (U&E) to assess renal function
- Coagulation profile (INR, APTT, fibrinogen)
- Liver function tests

Ideally results should be within the last 3 months to provide an accurate baseline for platelets and renal function.

5. General peri-operative and Anticoagulation principles

- Management of anticoagulation peri-operatively must take into account multiple factors including the type of procedure, the bleeding risk of the procedure, the patient's risk of thrombosis, clinician preference. The decision is commonly made by the proceduralist/anaesthetist.
- A significant portion of clients ceasing warfarin who are at a high risk of a thrombo-embolic event (see Appendix A) will require Enoxaparin bridging after above factors have been taken into account by clinician.

- Some moderate thrombo-embolic risk may also require Enoxaparin bridging depending on above factors.
- Enoxaparin bridging is not generally recommended in clients with a low thrombosis risk (see Appendix A).
- Enoxaparin bridging is not recommended in patients taking DOAC unless they have to have their DOAC withheld for prolonged periods of time (not related to timeframes for cessation due to renal/hepatic impairment) and have a moderate – high thrombosis risk.
- Timeframe for interrupting anticoagulant peri-operatively depends on the half-life of the anticoagulant and associated impact of renal and/or liver impairment particularly with DOAC/NOAC.
  - Warfarin is usually withheld for five full days prior to procedure.
  - Rivaroxaban/ Apixaban may be withheld for up to 72 hours in the setting of renal impairment and up to 7 days in the setting of liver cirrhosis.
  - Dabigatran may be withheld for up to 5 days in renal impairment.
- Once warfarin ceased, Enoxaparin should be commenced once INR is below the target INR range, unless stated otherwise by referrer.
- Refer to Appendix E for Target INR range in specific conditions If concerns, clarify target INR range with referrer/medical governance.
- If prolonged time off the DOAC and there is a high thrombosis risk, Enoxaparin sodium commencement can range from 1-3 days post cessation depending on the type of DOAC, renal function, liver function and other factors. Discuss with medical governance if queries.
- Before any high bleeding risk procedure, therapeutic treatment doses of Enoxaparin are administered at least 24 hours prior to the procedure and prophylactic Enoxaparin doses are administered at least 10-12 hours prior to the procedure.
- This will be different in other types of procedures where bleeding risk may be low, twice daily dosing of regime or other factors. If there is variation, this should be clarified with medical governance/ medical team at the hospital to ensure it is not an error and clearly document in the client records.
- Unfractionated Heparin is preferred over Enoxaparin in severe renal impairment.
- Enoxaparin clearance is reduced in renal impairment and can therefore increase bleeding risk. Some guidelines recommend halving Enoxaparin dose the day prior to certain high bleeding risk procedures in clients with Creatinine Clearance <30mL/min. eTG advises to consider

stopping Enoxaparin earlier in patients with impaired kidney function. The decision around this will vary depending on multiple factors (both patient and clinician).

- Renal function should be monitored regularly in patients receiving Enoxaparin therapy- more frequently if renal impairment until stabilised- see monitoring section.
- If a client is receiving Haemodialysis treatment, Enoxaparin is generally administered post dialysis treatment. Ensure an appropriate plan is in place for dialysis days to reflect this.
- The minimum time interval between twice daily Enoxaparin dosing is 10 hours. The maximum time interval between twice daily Enoxaparin dosing is 14 hours.
- Twice daily dosing of Enoxaparin is generally preferred for patients at high risk of bleeding (see Appendix C), at a high risk of thrombosis (Appendix A), patients who are older, obese (weight >100kg) or have a malignancy.
- If the Enoxaparin dose required is greater than 150mg, the dose must be given as a twice daily dose.
- Heparin induced thrombocytopenia (HIT) is a rare but potentially fatal complication of Enoxaparin treatment and must be monitored for the first 14 days of Enoxaparin treatment every time they are on Enoxaparin. HIT develops earlier in patients who have been exposed to Heparin before and so platelet testing should begin earlier in these cases. See Monitoring section for further details.

Commencement of Enoxaparin in combination or post treatment with Nirmatrelvir/Ritonavir (Paxlovid®) for the treatment of COVID-19

- Some patients may be required to withhold anticoagulation when on COVID 19 treatments such as Paxlovid and may require bridging with Enoxaparin.
- Enoxaparin sodium may be co-administered with Nirmatrelvir/Ritonavir without dose adjustment or increased monitoring requirements.
- Clinicians must be aware of the various drug interactions with Nirmatrelvir/Ritonavir.
- Consider expert consultation for clients receiving highly specialised therapies or medicines prone to concentration dependant toxicities.

See Appendix D (below) for guidance on the use of Nirmatrelvir/Ritonavir and anticoagulant/antiplatelet medications.

6. Recommended Enoxaparin dose (weight range 50-150kg, not pregnant)

- CG calculation is based on actual or ideal body weight (whichever is less).
- Measure creatinine clearance using Cockcroft-Gault (CG) calculation for all clients as below: -
  - Measure the client's height and weight.
  - Ascertain the Ideal body weight for the height and gender using the table in Appendix B.
  - If the client's weight is at or below the estimated ideal body weight, then use the actual measured body weight in the CG formula to calculate Creatinine clearance.
  - If the measured body weight is above the ideal body weight for the height, use the Ideal body weight for the CG calculation of Creatinine clearance.

Renal function	Treatment dose	VTE Prophylaxis dose
CG CrCl > 30mL/min	• 1.5 mg/kg SC daily* or • 1 mg/kg SC BD**	40mg once daily
CG CrCl ≤ 30mL/min	• 1 mg/kg SC daily	20mg once daily

* If dose required is greater than 150mg, dose must be given as twice daily dose which is the preferred choice in obese patients.

**Twice-daily dosing of Enoxaparin is preferred for patients at high risk of bleeding, high risk of thrombosis, acute coronary syndrome plus patients who are older, obese or have a malignancy.

- Patients with a weight of 120-150kg, may be referred with a different lower starting dose to the above calculation based on emerging guidelines around this weight range. Clarify the dose with the referrer if needed. Patients should have anti-Xa testing to check if the dose needs adjusting.
- If the patient is pregnant, weight >150kg, weight <50kg, impaired renal function (CG CrCl < 30ml/min), active bleeding/significant unexplained bruising on treatment; use of anti-Xa level monitoring is recommended for reviewing Enoxaparin treatment dose (not for prophylactic doses).

- Consult with haematology, obstetric (if pregnant) or renal team for starting dose.
- Blood test for Anti-Xa should be performed 4 hours post-dosing and may be performed after 3rd or 4th dose post commencement of Enoxaparin.
- Review results with haematologist for advice re dosage adjustment and recheck Anti-Xa and above process until dose stabilised.

7. General management

- Daily nursing assessment as per Pre-surgical Bridging Care Pathway.
- Collaborate with medical governance doctor if any deterioration in client's condition as per usual processes.
- Ensure below required information is available. Liaise with referrer or medical governance to gather the required information if not available/clarification as part of the admission process to service.
    - Date of procedure
    - What procedure
    - Place of procedure
    - Time of procedure i.e. morning list or afternoon list. Exact time of procedure is often unknown so assume if on morning list they are first on the list i.e. early morning.
    - Type of oral anticoagulation patient has been/is on and when last dose was taken
    - Reason for anticoagulation
    - Usual dose
    - Target INR if on Warfarin
    - Last INR and date
    - Enoxaparin treatment plan: prophylactic/therapeutic treatment, dosing, frequency, when to start Enoxaparin, last Enoxaparin date and time.
    - Contact details for referrer/medical team involved in the procedure for queries regarding anticoagulation plan
    - Confirm who is holding medical governance
    - Access blood results from referral source. Collaborate with medical governance doctor regarding any abnormal test results.

- Measure creatinine clearance using Cockcroft-Gault (CG) calculation for all clients as below: -
  - Measure the client's height and weight.
  - Ascertain the Ideal body weight for the height and gender using the table in Appendix B.
  - If the client's weight is at or below the estimated ideal body weight, then use the actual measured body weight in the CG formula to calculate Creatinine clearance.
  - If the measured body weight is above the ideal body weight for the height, use the Ideal body weight for the CG calculation of Creatinine clearance.

- Nurses to confirm Enoxaparin dosing on medication order with Medical Governance advising them of admission information including the CG Creatinine clearance calculation.
- Identify when Enoxaparin is to commence pre-procedure
- Date and time of last Enoxaparin dose pre – procedure.
- Ensure visits have been scheduled appropriately.
- Highlight as per individual state service policies whether it is once/twice daily dosing on the medication order/authority to reduce missed dose medication errors.
- Explore whether patient is a candidate for self-administration of Enoxaparin and education process for this can be commenced.
- Administer Enoxaparin as per medical authority.
- If client has been on warfarin, daily check of INR is recommended at least until it falls below the therapeutic range. (Appendix E has common INR target ranges for certain conditions).
- If INR is 2 or more the day before the procedure, contact medical governance and surgical team as client may require vitamin K/postponement of the procedure. A lot of procedures require the INR to be <1.5 on the day of the procedure to proceed.
- If the INR is above the therapeutic range, see Appendix C for management guidance on high INR without bleeding or with bleeding. POC machine is inaccurate at INR ≥ 3.5 and a formal INR blood test may be required for accurate INR reading. Discuss this with medical governance.
- DOAC do not require INR monitoring unless concerns about pre-existing liver disease and requested by medical governance/referrer.
- Phone call contact to patient +/- hospital department where procedure performed should be scheduled on the day of the procedure to ensure procedure has gone ahead and plan regarding post procedure bridging.

- If post-procedure bridging will occur within Silverchain services, check a referral is already in place or seek a new referral) and schedule visits as appropriate.

8. Monitoring

- When treating with Enoxaparin, measure the patient's FBC (specifically platelet count) at baseline.
  - If the patient has not previously been treated with any type of Heparin, measure the platelet count on Day 5 post commencement, and re check the platelet count every 2-3 days/ at least twice weekly during therapy until at least Day 14.
  - If the patient has previously been treated with a Heparin, measure the platelet count on Day 2 after starting Enoxaparin and re check the platelet count every 2-3 days/at least twice weekly during therapy, until at least Day 14.
  - If platelets drop by more than 30% from baseline or to <100 $x10^9$/L, the 4T's score for HIT can help with assessment and then subsequent discussion with a Haematology consultant for a plan re: Enoxaparin and investigations.
- Renal function up to twice weekly until stable especially if moderate to severe renal impairment. Less frequent if stable.
- If the patient is pregnant, weight >150kg, weight <50kg, impaired renal function (CG CrCl < 30ml/min), active bleeding/significant unexplained bruising on treatment; use of anti-Xa level monitoring is recommended for reviewing Enoxaparin treatment dose (not for prophylactic doses).
  - Consult with haematology, obstetric (if pregnant) or renal team for starting dose.
  - Blood test for Anti-Xa should be performed 4 hours post-dosing and ideally done after 3rd or 4th dose post commencement of Enoxaparin.
  - Review results with haematologist for advice re dosage adjustment and recheck Anti-Xa and above process until dose stabilised.

9. Medical governance

- The client must have access to medical governance support 24 hours per day, 7 days per week.
- Primary medical governance can be by referring medical specialists, credentialed referring GPs or by Silver Chain medical staff.

- When governance is retained by a Silver Chain medical officer the client will have a medical review within 48 hours of admission and the medical officer will determine when the scheduled follow up and discharge will occur.
- Where the primary medical governor is unavailable the Silver Chain medical officer can provide the medical advice/support.
- Care delivery is planned and provided in consultation with the client, medical officer/specialist holding medical governance and nursing staff.
- In the instance when a client's condition deteriorates the Silver Chain medical officer or nursing staff will confer with an emergency department medical officer.
- A summary of the episode of care must be sent to the referrer or the client's GP at discharge and must clearly state the plan for when next INR or other monitoring needs to occur (if required).

10. Discharge planning

- Check if post procedure bridging referral already in place and ensure appropriate visits are scheduled.
- If no post procedure bridging referral in place, in WA give client the letter in document BC-WI-0563 to take with them on the day of the procedure to be handed to the hospital treating team.
- For WA, as per document BC-WI- 0563, schedule a phone call to the client on the day of the procedure to ensure the procedure did go ahead and the plan for discharge if this is already in place.
- Fax client discharge summary to GP including any blood results like Anti-Xa levels for future management.

11. Supporting documents

Silverchain policy and related documents that directly relate to and inform this procedure are available with this document in the Policy Document Management System (PDMS).

Other documents that directly relate to and inform this procedure are as follows:

- Australian Commission on Safety and Quality in Health Care 2017 National Safety and Quality Health Service Standards (2nd), Sydney. Australia
- eTG complete. 2023. Therapeutic Guidelines. CCG and Ideal body weight tables. https://tgldcdp-tg-org-

au.silverchain.idm.oclc.org/viewTopic?etgAccess=true&guidelinePage=Antibiotic&topicfile=antimicrobial-dosing-renal-impairment&guidelinename=Antibiotic&sectionId=toc_d1e65#toc_d1e65

- Government of Western Australia Department of Health. 2020. Guidelines for Anticoagulation using Warfarin. https://ww2.health.wa.gov.au/-/media/Files/Corporate/general-documents/WATAG/Warfarin-guidelines-for-anticoagulation.pdf

- Clinical Excellence Commission. Guidelines on Perioperative Management of Anticoagulant and Antiplatelet Agents. 2018; https://www.cec.health.nsw.gov.au/__data/assets/pdf_file/0006/458988/Guidelines-on-perioperative-management-of-anticoagulant-and-antiplatelet-agents.pdf

- Queensland Health. Guidelines for warfarin management in the community. 2016. https://www.health.qld.gov.au/__data/assets/pdf_file/0025/443806/warfarin-guidelines.pdf

- Government of Western Australia Department of Health. 2022. Guidelines for the WA Anticoagulation Medication chart (WA AMC). https://www.health.wa.gov.au/~/media/Corp/Documents/Health-for/MTU/User-guidelines-WA-AMC.pdf

- Queensland Health. Anticoagulant guidelines for Hospitalised Adult patients. 2022 https://www.health.qld.gov.au/__data/assets/pdf_file/0015/1152213/statewide-anticoagulant-guideline.pdf

12. Document details

Document owner	Executive Medical Director, East Coast
Consumer participation	☐ Yes ☒ Not applicable
Document type	CP - Clinical Protocol
Functional area	Acute
Risk rating	Moderate
Periodic review	36 months

Silverchain's policies align with relevant legislation and standards and are based on providing a fair, inclusive, and safe working environment free from bullying and discrimination and one that enables equal opportunity for all Silverchain staff.

Our policies embody our values of integrity, respect, trust, and compassion.

Appendix A Perioperative Thromboembolic risk Stratification

Thrombosis Risk	Mechanical Heart valves	Atrial fibrillation (AF)	Venous Thromboembolism (VTE)
Low (Bridging not recommended)	• Bi-leaflet aortic valve prosthesis without AF and no other risk factors for stroke	• $CHAD_2DS_2$-VA score of 3 or less and no prior history of stroke or TIA.	• A single VTE episode that was not life-threatening more than 12 months ago with no other risk factors
Moderate (asses on case by case basis)	• Bileaflet aortic valve prosthesis and one or more of the following risk factors: • AF • Prior stroke or TIA • Hypertension • Diabetes • Congestive cardiac failure • Age >75 years	• $CHAD_2DS_2$-VA score of 4 or 5 • $CHAD_2DS_2$-VA score less than 4 with prior history of stroke/TIA or peripheral arterial embolism >3 months	• VTE within the past 3-12 months • Non- severe thrombophilia (e.g. heterozygous Factor V Leiden or prothrombin gene mutation) • Recurrent VTE or a single non-provoked life threatening VTE • Active cancer (treated within last 6 months or palliative)
High (Bridging recommended)	• Any Mitral valve prosthesis • Any caged-ball or tilting disc aortic valve prosthesis • Recent stroke or TIA (within 6 months)	• Recent stroke or TIA (within last 3 months) • AF with Rheumatic valvular disease (mitral valve disease i.e. stenosis/regurgitation) • CHA_2DS_2-VA score of 6 or more	• Recent VTE (within last 3 months) • High risk thrombophilia (e.g. deficiency of protein C, protein S or antithrombin III; antiphospholipid antibodies, multiple abnormalities)

Appendix B Ideal Body Weight for Height and Gender

Height		Ideal body weight in kg	
cm	Feet (‘) & Inches (“)	Female	Male
155	5’	48	53
160	5’ 2”	53	57
165	5’ 4”	57	62
170	5’ 6”	62	66
175	5’ 7”	66	71
180	5’ 9”	71	75
185	6’	75	80
190	6’ 2”	80	84
195	6’ 4”	84	89
200	6’ 6”	89	93
205	6’ 7”	93	98
210	6’ 9”	98	102
215	7’	102	107
220	7’ 2”	107	111

- eTG complete. 2023. Therapeutic Guidelines. CCG and Ideal body weight tables- modified. https://tgldcdp-tg-org-au.silverchain.idm.oclc.org/viewTopic?etgAccess=true&guidelinePage=Antibiotic&topicfile=antimicrobial-dosing-renal-impairment&guidelinename=Antibiotic&sectionId=toc_d1e65#toc_d1e65

Appendix C Management of Bleeding and/or High INR (Over-anticoagulation)

- INR ≥ 3.5 on Point of Care (POC) machine e.g. Coaguchek mandates laboratory specimen to be taken.
- Laboratory specimen is considered as 'gold standard' and should be utilised in preference to POC machine

REVERSING WARFARIN OVER-TREATMENT **(Bleeding risk increases exponentially from INR 5 to 9. Monitor closely INR ≥ 6)**					
Clinical Setting		Management			
INR	**Bleeding**	**Warfarin**	**Vitamin K *(seek advice if cardiac valve replacement)***		**Comments**
Greater than therapeutic range but less than <4.5	Absent	Reduce dose or omit next dose			Resume warfarin at reduce dose when INR approaches therapeutic range. If INR <10% above therapeutic level, dose reduction may not be necessary.
4.5-10	Absent (Low risk)	Stop			Measure INR in 24 hours. Resume warfarin at reduced dose when INR approaches the therapeutic range.
	Absent (*High risk)	Stop	Consider 1-2mg (oral) or 0.5-1mg IV		Measure INR within 24 hours. Resume warfarin at reduced dose when INR approaches the therapeutic range.
>10	Absent (Low risk)	Stop	Consider 3-5mg (oral) or transfer to hospital for IV		Measure INR in 12-24 hours. Resume warfarin at reduced dose when INR approaches the therapeutic range.
	Absent (*High risk)	Stop	Transfer to hospital for IV vitamin K and possible Prothrombinex VF.		When warfarin recommenced, close monitoring required over the following week.
*High bleeding risk = one of more of →		Recent surgery/trauma/bleed	Renal failure	Alcohol abuse	Antiplatelet therapy
		Advanced age	Hypertension	Active GI bleed	Other relevant co-morbidity e.g. severe liver disease

From: https://www.health.wa.gov.au/~/media/Files/Corporate/general-documents/WATAG/Warfarin-guidelines-for-anticoagulation.pdf with modifications

Management of patients on warfarin/Enoxaparin/DOAC therapy with bleeding or significant bruising*

Inform and discuss plan with medical governance in all clinical settings.

Clinical setting	Recommendation
Life threatening bleeding	Basic life support protocol, ring 000 for immediate hospital transfer. Withhold all anticoagulation.
Clinically significant bleeding	Cease anticoagulation and transfer immediately to hospital (BLS and 000 if clinically indicated)
Minor bleeding/ significant bruising whilst on anticoagulation therapy	Discuss with Medical Governance for tailored plan. Recommendations may include actively managing/monitoring bleeding based on clinical judgement, omit/reduced anticoagulant therapy, close monitoring of INR if applicable, anti-Xa tests and transfer to hospital if worsening bleeding/concerns.

Appendix D Drug interactions between Nirmatrelvir/Ritonavir (Paxlovid®) and anticoagulant/Antiplatelet medications

Note: Co-administration of medications with Nirmatrelvir/Ritonavir has not been studied. Advice is based on metabolism and clearance.

Use of Nirmatrelvir and Ritonavir (Paxlovid®) tablets and oral anticoagulants

- Warfarin

  Co-administration may increase or decrease Warfarin concentrations. Closely monitor INR if co-administration is necessary. Educate clients on potential adverse effects.

- Apixaban / Rivaroxaban / Dabigatran

  DO NOT co-administer. Consider switching to Enoxaparin. Potentially increased concentrations of Apixaban / Rivaroxaban / Dabigatran which may lead to an increased bleeding risk.

  The usual Apixaban / Rivaroxaban / Dabigatran treatment should be resumed 3 days after the last dose of Nirmatrelvir/Ritonavir (Paxlovid®).

Use of Nirmatrelvir and Ritonavir (Paxlovid®) tablets and oral antiplatelets

- Ticagrelor

  DO NOT co-administer. Use is contraindicated and may lead to a substantial increase in exposure to Ticagrelor.

- Clopidogrel

  Co-administration should be avoided. May decrease the concentration of Clopidogrel and reduce its effect.

- Aspirin / Prasugrel

  No interaction expected. Clinically significant interactions are unlikely.

Appendix E Guide to INR target ranges based on conditions

Target Range	Condition
2-3	DVT/PE Atrial Fibrillation with high stroke risk factors/previous stroke. Hypercoagulable conditions e.g. thrombophilia. Preventing systemic Embolism: AF, Valvular heart disease, post MI and bioprosthetic heart valves (3 months) Aortic bi-leaflet mechanical valves with no other risk factors Cardiac thrombus Preventing DVT in high-risk patients e.g. post knee/hip surgery
2.5- 3.5	Starr-Edwards mechanical heart valves/other high risk mechanical valves Mitral mechanical valves Aortic heart valve with risk factors (AF, previous thromboembolism, hypercoagulable condition, left ventricular dysfunction, older generation AVR)
other	Under instructions from haematologist