Government of **Western Australia**
Department of **Health**

WA Anticoagulation Medication Chart

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Overview

This presentation will provide an overview of:

- The layout of the WA Anticoagulation Medication Chart (WA AMC)
- The management of anticoagulants using the chart:
  - Low Molecular Weight Heparins (LMWH)
  - Unfractionated heparin (UFH)
  - Warfarin
  - Direct oral anticoagulants (DOACs)

Anticoagulants – High Risk Medications

- Anticoagulants are consistently identified as causing preventable harm to patients.
- When used in error or omitted, they can cause life-threatening or fatal bleeding or thrombosis.
- Anticoagulants were the fourth most frequent medication class involved in confirmed clinical incidents for 2022/23[1]

Medication categories (top 6)	(n)	(%)
Opioid analgesics (opioid based pain relievers)	1,202	12.6
Antibacterials (antibiotics)	926	9.7
Insulins (medications used for diabetes)	687	7.2
Anticoagulants (blood thinning medications)	630	6.6
Antihypertensives (medications for high blood pressure)	417	4.4
Antipsychotics (medications for major psychiatric disorders)	393	4.1

1. Patient Safety Surveillance Unit (2023), Your Safety in Our Hands in Hospital. An Integrated Approach to Patient Safety Surveillance by WA Health Service Providers, Hospitals and the Community: 2022. Delivering Safer Care Series Report Number 12. Department of Health: Perth. Version 1

Anticoagulants

- The most commonly prescribed anticoagulants are:
  - unfractionated heparin (UFH)
  - low-molecular weight heparin (LMWH)
    - enoxaparin sodium (Clexane®)
    - dalteparin sodium (Fragmin®)
    - warfarin (Marevan®).

- Direct oral anticoagulants (DOACs) are also available and are being prescribed more frequently:
  - apixaban (Eliquis®)
  - dabigatran (Pradaxa®)
  - rivaroxaban (Xarelto®).

Factors that increase the potential for error and harm include:

- Low margin for error
  - over-dose → bleeding
  - under-dose or omission → thrombosis
- Wide variation in individual patient response
  - multiple indications
  - wide range and complexity of dosage
  - frequent dose adjustment/monitoring
  - interaction with other medicines, herbals, over-the-counter products, food and alcohol.

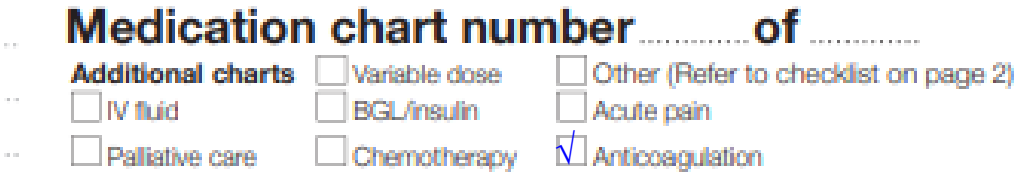
Benefits of the WA Anticoagulation Medication Chart

- Provides one chart for all anticoagulant prescriptions to reduce the risk of duplicate prescribing.
- Point of care guidelines for initiation, monitoring and reversal of anticoagulants.
- Enables the effective achievement of therapeutic levels.
- Minimise the risk of bleeding events due to supra-therapeutic levels.
- To achieve this the chart includes:
  - Optimal dosing guidelines and monitoring requirements
  - Important information required for dosing including test results, weight and renal function

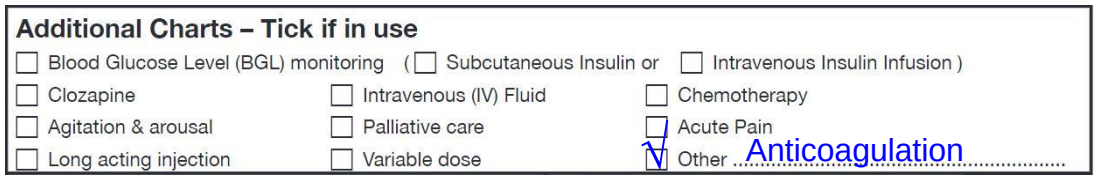
Importance of Cross-Referencing Anticoagulation Chart with WA HMC

- The main WA Hospital medication chart (WA HMC) MUST be annotated (cross-referenced) to identify when the anticoagulation chart is in use to reduce the risk of duplicated orders or dose omissions.

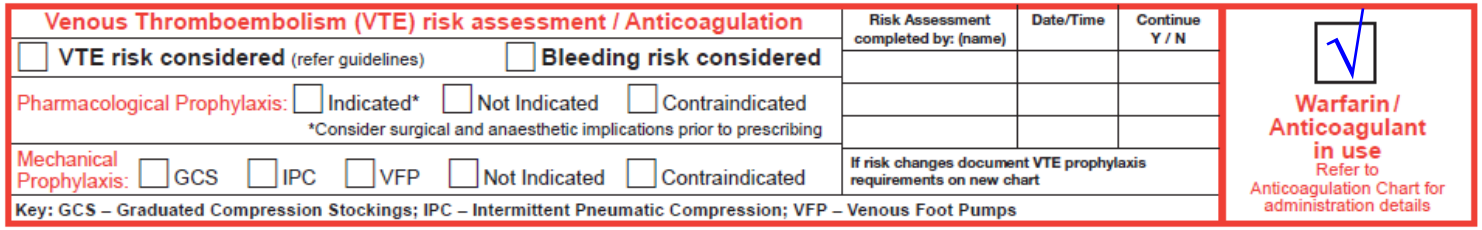
Front of WA HMC



Inside of WA HMC

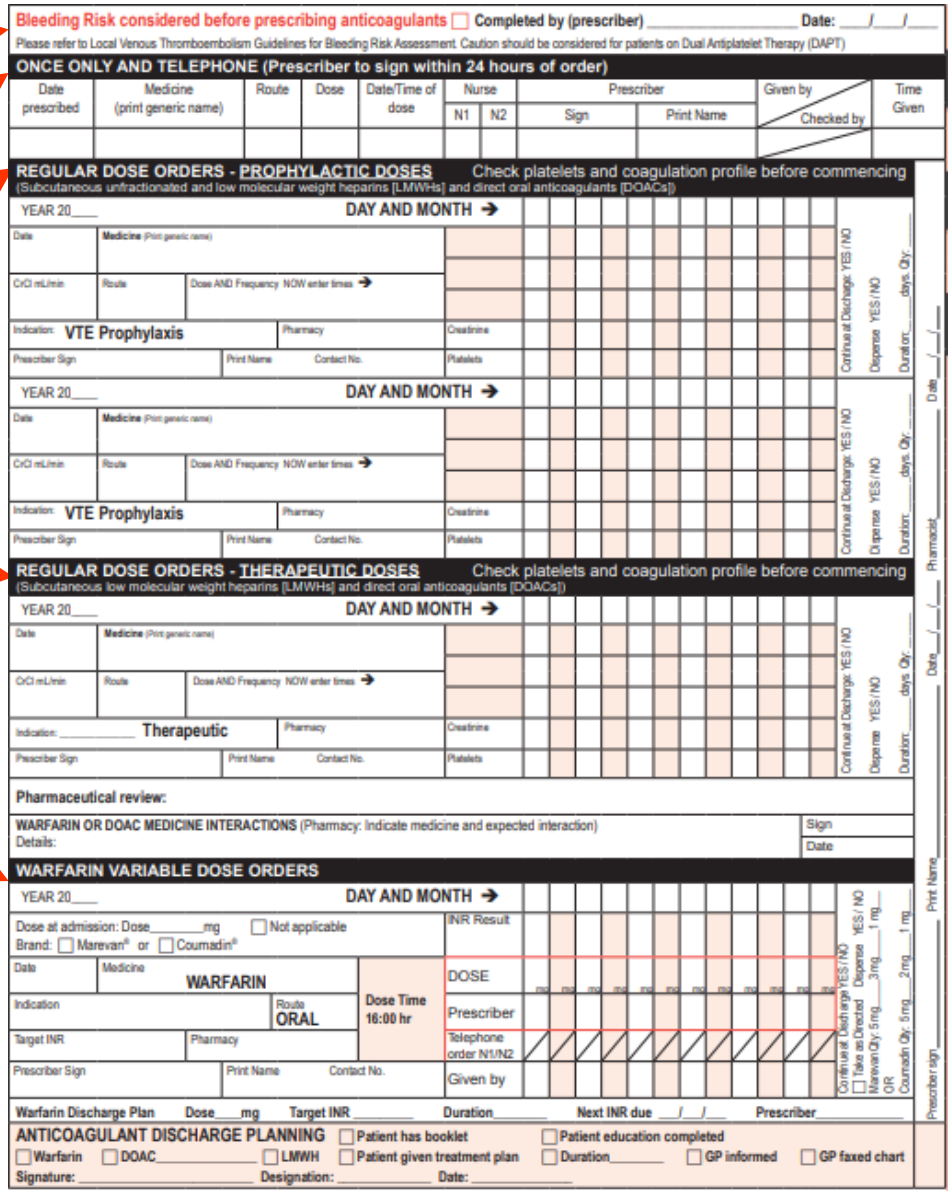


Inside of WA HMC



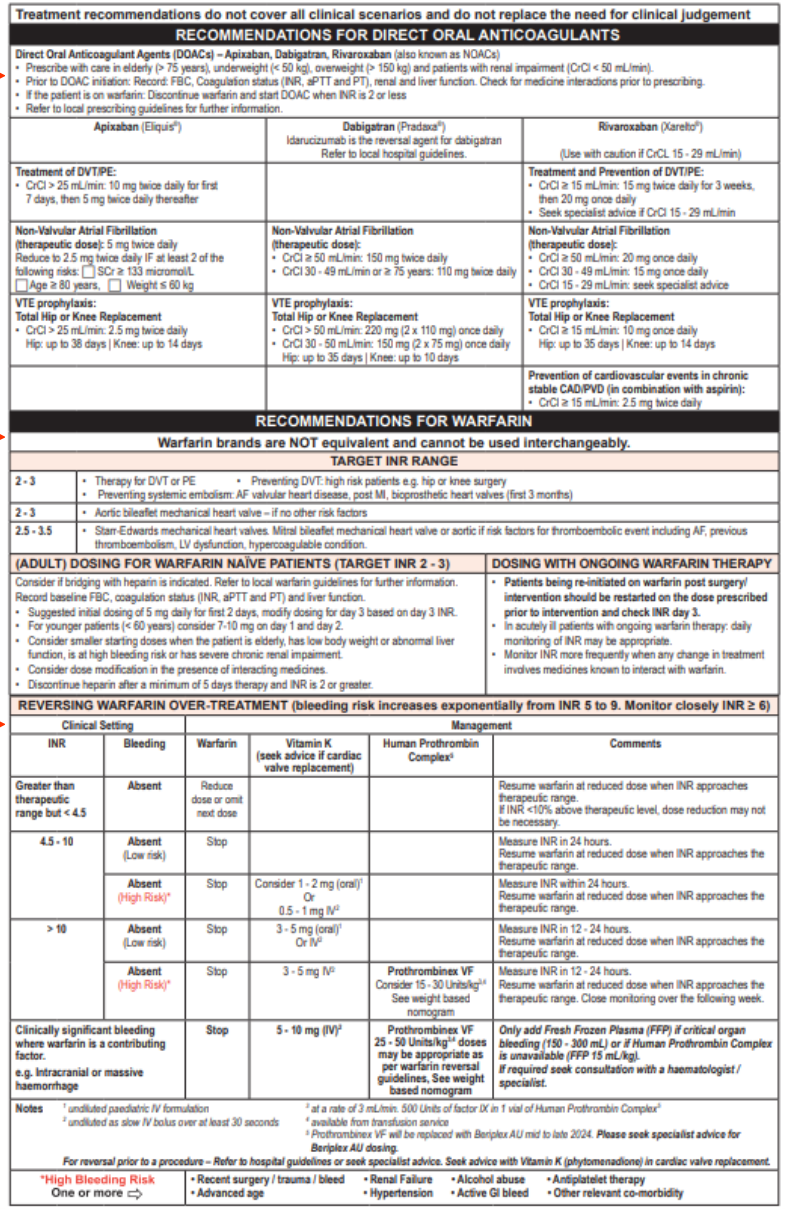
WA AMC - The front page

- Bleeding risk considered
- Once only and telephone
- Regular dose orders (prophylactic)
- Regular dose orders (therapeutic)
- Variable dose orders - warfarin



WA AMC - The back page

- Recommendations for direct oral anticoagulants
- Recommendations for warfarin
- Updated warfarin reversal guidelines



Treatment recommendations do not cover all clinical scenarios and do not replace the need for clinical judgement

RECOMMENDATIONS FOR DIRECT ORAL ANTICOAGULANTS

Direct Oral Anticoagulant Agents (DOACs) – Apixaban, Dabigatran, Rivaroxaban (also known as NOACs)
- Prescribe with care in elderly (> 75 years), underweight (< 50 kg), overweight (> 150 kg) and patients with renal impairment (CrCl < 50 mL/min).
- Prior to DOAC initiation: Record: FBC, Coagulation status (INR, aPTT and PT), renal and liver function. Check for medicine interactions prior to prescribing.
- If the patient is on warfarin: Discontinue warfarin and start DOAC when INR is 2 or less
- Refer to local prescribing guidelines for further information.

Apixaban (Eliquis®)	**Dabigatran** (Pradaxa®) Idarucizumab is the reversal agent for dabigatran Refer to local hospital guidelines.	**Rivaroxaban** (Xarelto®) (Use with caution if CrCL 15 - 29 mL/min)
Treatment of DVT/PE: • CrCl > 25 mL/min: 10 mg twice daily for first 7 days, then 5 mg twice daily thereafter		**Treatment and Prevention of DVT/PE:** • CrCl ≥ 15 mL/min: 15 mg twice daily for 3 weeks, then 20 mg once daily • Seek specialist advice if CrCl 15 - 29 mL/min
Non-Valvular Atrial Fibrillation (therapeutic dose): 5 mg twice daily Reduce to 2.5 mg twice daily IF at least 2 of the following risks: ☐ SCr ≥ 133 micromol/L ☐ Age ≥ 80 years, ☐ Weight ≤ 60 kg	**Non-Valvular Atrial Fibrillation (therapeutic dose):** • CrCl ≥ 50 mL/min: 150 mg twice daily • CrCl 30 - 49 mL/min or ≥ 75 years: 110 mg twice daily	**Non-Valvular Atrial Fibrillation (therapeutic dose):** • CrCl ≥ 50 mL/min: 20 mg once daily • CrCl 30 - 49 mL/min: 15 mg once daily • CrCl 15 - 29 mL/min: seek specialist advice
VTE prophylaxis: **Total Hip or Knee Replacement** • CrCl > 25 mL/min: 2.5 mg twice daily Hip: up to 38 days | Knee: up to 14 days	**VTE prophylaxis:** **Total Hip or Knee Replacement** • CrCl > 50 mL/min: 220 mg (2 x 110 mg) once daily • CrCl 30 - 50 mL/min: 150 mg (2 x 75 mg) once daily Hip: up to 35 days | Knee: up to 10 days	**VTE prophylaxis:** **Total Hip or Knee Replacement** • CrCl ≥ 15 mL/min: 10 mg once daily Hip: up to 35 days | Knee: up to 14 days
		Prevention of cardiovascular events in chronic stable CAD/PVD (in combination with aspirin): • CrCl ≥ 15 mL/min: 2.5 mg twice daily

RECOMMENDATIONS FOR WARFARIN

Warfarin brands are NOT equivalent and cannot be used interchangeably.

TARGET INR RANGE

2 - 3	• Therapy for DVT or PE • Preventing DVT: high risk patients e.g. hip or knee surgery • Preventing systemic embolism: AF valvular heart disease, post MI, bioprosthetic heart valves (first 3 months)
2 - 3	• Aortic bileaflet mechanical heart valve – if no other risk factors
2.5 - 3.5	• Starr-Edwards mechanical heart valves. Mitral bileaflet mechanical heart valve or aortic if risk factors for thromboembolic event including AF, previous thromboembolism, LV dysfunction, hypercoagulable condition.

(ADULT) DOSING FOR WARFARIN NAÏVE PATIENTS (TARGET INR 2 - 3)

Consider if bridging with heparin is indicated. Refer to local warfarin guidelines for further information.
Record baseline FBC, coagulation status (INR, aPTT and PT) and liver function.
- Suggested initial dosing of 5 mg daily for first 2 days, modify dosing for day 3 based on day 3 INR.
- For younger patients (< 60 years) consider 7-10 mg on day 1 and day 2.
- Consider smaller starting doses when the patient is elderly, has low body weight or abnormal liver function, is at high bleeding risk or has severe chronic renal impairment.
- Consider dose modification in the presence of interacting medicines.
- Discontinue heparin after a minimum of 5 days therapy and INR is 2 or greater.

DOSING WITH ONGOING WARFARIN THERAPY

- **Patients being re-initiated on warfarin post surgery/ intervention should be restarted on the dose prescribed prior to intervention and check INR day 3.**
- In acutely ill patients with ongoing warfarin therapy: daily monitoring of INR may be appropriate.
- Monitor INR more frequently when any change in treatment involves medicines known to interact with warfarin.

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)**	**Human Prothrombin Complex[4]**	**Comments**
Greater than therapeutic range but < 4.5	**Absent**	Reduce dose or omit next dose			Resume warfarin at reduced 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 - 2 mg (oral)[1] Or 0.5 - 1 mg IV[2]		Measure INR within 24 hours. Resume warfarin at reduced dose when INR approaches the therapeutic range.
> 10	**Absent** (Low risk)	Stop	3 - 5 mg (oral)[1] Or IV[2]		Measure INR in 12 - 24 hours. Resume warfarin at reduced dose when INR approaches the therapeutic range.
	Absent (High Risk)*	Stop	3 - 5 mg IV[2]	**Prothrombinex VF** Consider 15 - 30 Units/kg[3,4] See weight based nomogram	Measure INR in 12 - 24 hours. Resume warfarin at reduced dose when INR approaches the therapeutic range. Close monitoring over the following week.
Clinically significant bleeding where warfarin is a contributing factor. **e.g. Intracranial or massive haemorrhage**		**Stop**	**5 - 10 mg (IV)[2]**	**Prothrombinex VF 25 - 50 Units/kg[3,4] doses may be appropriate as per warfarin reversal guidelines, See weight based nomogram**	***Only add Fresh Frozen Plasma (FFP) if critical organ bleeding (150 - 300 mL) or if Human Prothrombin Complex is unavailable (FFP 15 mL/kg).*** ***If required seek consultation with a haematologist / specialist.***

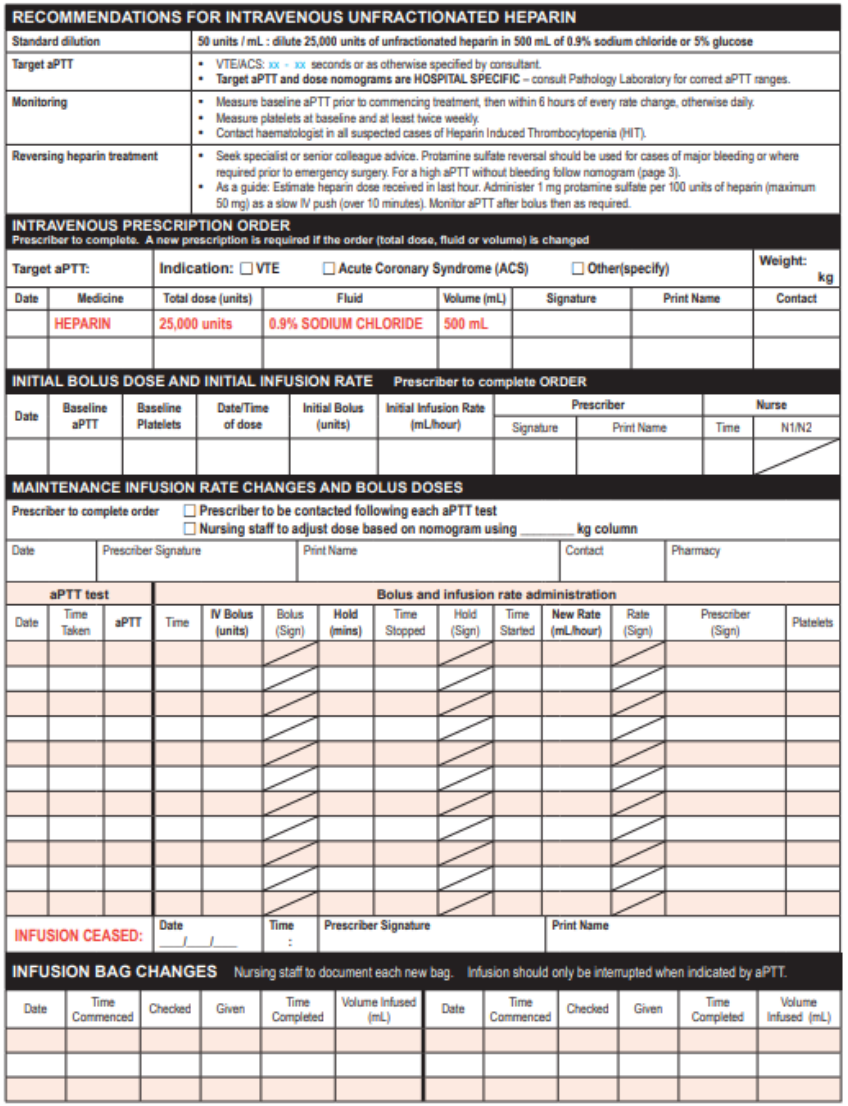
Notes
[1] *undiluted paediatric IV formulation*
[2] *undiluted as slow IV bolus over at least 30 seconds*
[3] *at a rate of 3 mL/min. 500 Units of factor IX in 1 vial of Human Prothrombin Complex*
[4] *available from transfusion service*
[5] *Prothrombinex VF will be replaced with Beriplex AU mid to late 2024. **Please seek specialist advice for Beriplex AU dosing.***

For reversal prior to a procedure – Refer to hospital guidelines or seek specialist advice. Seek advice with Vitamin K (phytomenadione) in cardiac valve replacement.

***High Bleeding Risk**
One or more ⇨
• Recent surgery / trauma / bleed • Renal Failure • Alcohol abuse • Antiplatelet therapy
• Advanced age • Hypertension • Active GI bleed • Other relevant co-morbidity

WA AMC - The middle pages (prescribing and administering IV heparin)

- Recommendation for IV unfractionated heparin
- Intravenous prescription order
- Initial bolus and infusion rate
- Maintenance infusion rate and bolus dose
- Infusion bag changes



RECOMMENDATIONS FOR INTRAVENOUS UNFRACTIONATED HEPARIN

Standard dilution	50 units / mL : dilute 25,000 units of unfractionated heparin in 500 mL of 0.9% sodium chloride or 5% glucose
Target aPTT	• VTE/ACS: xx - xx seconds or as otherwise specified by consultant. • Target aPTT and dose nomograms are HOSPITAL SPECIFIC – consult Pathology Laboratory for correct aPTT ranges.
Monitoring	• Measure baseline aPTT prior to commencing treatment, then within 6 hours of every rate change, otherwise daily. • Measure platelets at baseline and at least twice weekly. • Contact haematologist in all suspected cases of Heparin Induced Thrombocytopenia (HIT).
Reversing heparin treatment	• Seek specialist or senior colleague advice. Protamine sulfate reversal should be used for cases of major bleeding or where required prior to emergency surgery. For a high aPTT without bleeding follow nomogram (page 3). • As a guide: Estimate heparin dose received in last hour. Administer 1 mg protamine sulfate per 100 units of heparin (maximum 50 mg) as a slow IV push (over 10 minutes). Monitor aPTT after bolus then as required.

INTRAVENOUS PRESCRIPTION ORDER
Prescriber to complete. A new prescription is required if the order (total dose, fluid or volume) is changed

Target aPTT: | Indication: ☐ VTE ☐ Acute Coronary Syndrome (ACS) ☐ Other(specify) | Weight: kg

Date	Medicine	Total dose (units)	Fluid	Volume (mL)	Signature	Print Name	Contact
	HEPARIN	25,000 units	0.9% SODIUM CHLORIDE	500 mL			

INITIAL BOLUS DOSE AND INITIAL INFUSION RATE Prescriber to complete ORDER

Date	Baseline aPTT	Baseline Platelets	Date/Time of dose	Initial Bolus (units)	Initial Infusion Rate (mL/hour)	Prescriber		Nurse	
						Signature	Print Name	Time	N1/N2

MAINTENANCE INFUSION RATE CHANGES AND BOLUS DOSES

Prescriber to complete order ☐ Prescriber to be contacted following each aPTT test
☐ Nursing staff to adjust dose based on nomogram using _____ kg column

Date	Prescriber Signature	Print Name	Contact	Pharmacy

aPTT test			Bolus and infusion rate administration										
Date	Time Taken	aPTT	Time	IV Bolus (units)	Bolus (Sign)	Hold (mins)	Time Stopped	Hold (Sign)	Time Started	New Rate (mL/hour)	Rate (Sign)	Prescriber (Sign)	Platelets

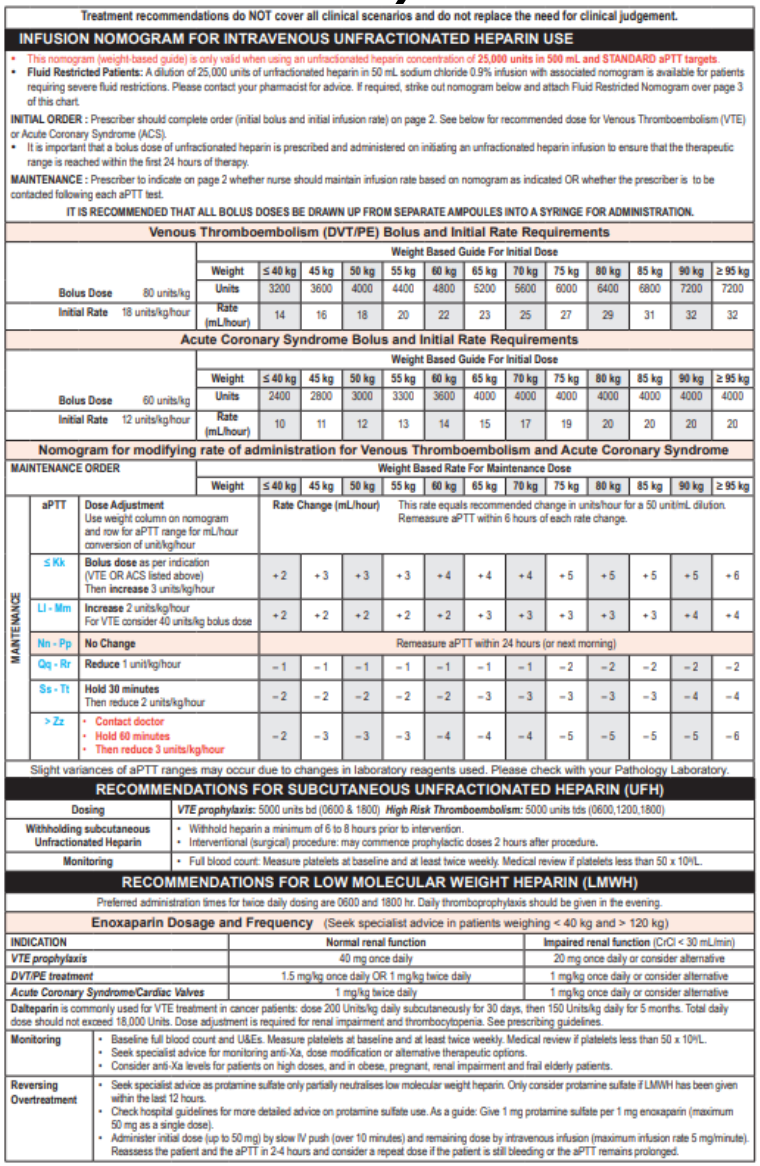
INFUSION CEASED: Date ___/___/___ | Time : | Prescriber Signature | Print Name

INFUSION BAG CHANGES Nursing staff to document each new bag. Infusion should only be interrupted when indicated by aPTT.

Date	Time Commenced	Checked	Given	Time Completed	Volume Infused (mL)	Date	Time Commenced	Checked	Given	Time Completed	Volume Infused (mL)

WA AMC - The middle pages (dosing recommendations)

- Infusion nomogram for intravenous unfractionated heparin use
- Venous Thromboembolism (VTE) bolus and initial rate
- Acute Coronary Syndromes (ACS) bolus and initial rate
- Nomogram for rate change
- Recommendations for unfractionated subcutaneous heparin
- Recommendations for LMWH



Treatment recommendations do NOT cover all clinical scenarios and do not replace the need for clinical judgement.

INFUSION NOMOGRAM FOR INTRAVENOUS UNFRACTIONATED HEPARIN USE

- This nomogram (weight-based guide) is only valid when using an unfractionated heparin concentration of **25,000 units in 500 mL and STANDARD aPTT targets**.
- **Fluid Restricted Patients:** A dilution of 25,000 units of unfractionated heparin in 50 mL sodium chloride 0.9% infusion with associated nomogram is available for patients requiring severe fluid restrictions. Please contact your pharmacist for advice. If required, strike out nomogram below and attach Fluid Restricted Nomogram over page 3 of this chart.

INITIAL ORDER : Prescriber should complete order (initial bolus and initial infusion rate) on page 2. See below for recommended dose for Venous Thromboembolism (VTE) or Acute Coronary Syndrome (ACS).

- It is important that a bolus dose of unfractionated heparin is prescribed and administered on initiating an unfractionated heparin infusion to ensure that the therapeutic range is reached within the first 24 hours of therapy.

MAINTENANCE : Prescriber to indicate on page 2 whether nurse should maintain infusion rate based on nomogram as indicated OR whether the prescriber is to be contacted following each aPTT test.

IT IS RECOMMENDED THAT ALL BOLUS DOSES BE DRAWN UP FROM SEPARATE AMPOULES INTO A SYRINGE FOR ADMINISTRATION.

Venous Thromboembolism (DVT/PE) Bolus and Initial Rate Requirements

		Weight Based Guide For Initial Dose												
	Weight	≤ 40 kg	45 kg	50 kg	55 kg	60 kg	65 kg	70 kg	75 kg	80 kg	85 kg	90 kg	≥ 95 kg
Bolus Dose 80 units/kg	Units	3200	3600	4000	4400	4800	5200	5600	6000	6400	6800	7200	7200
Initial Rate 18 units/kg/hour	Rate (mL/hour)	14	16	18	20	22	23	25	27	29	31	32	32

Acute Coronary Syndrome Bolus and Initial Rate Requirements

		Weight Based Guide For Initial Dose												
	Weight	≤ 40 kg	45 kg	50 kg	55 kg	60 kg	65 kg	70 kg	75 kg	80 kg	85 kg	90 kg	≥ 95 kg
Bolus Dose 60 units/kg	Units	2400	2800	3000	3300	3600	4000	4000	4000	4000	4000	4000	4000
Initial Rate 12 units/kg/hour	Rate (mL/hour)	10	11	12	13	14	15	17	19	20	20	20	20

Nomogram for modifying rate of administration for Venous Thromboembolism and Acute Coronary Syndrome

MAINTENANCE ORDER			Weight Based Rate For Maintenance Dose												
		Weight	≤ 40 kg	45 kg	50 kg	55 kg	60 kg	65 kg	70 kg	75 kg	80 kg	85 kg	90 kg	≥ 95 kg
MAINTENANCE	aPTT	Dose Adjustment Use weight column on nomogram and row for aPTT range for mL/hour conversion of unit/kg/hour	Rate Change (mL/hour) This rate equals recommended change in units/hour for a 50 unit/mL dilution. Remeasure aPTT within 6 hours of each rate change.												
	≤ Kk	**Bolus dose** as per indication (VTE OR ACS listed above) Then **increase** 3 units/kg/hour	+2	+3	+3	+3	+4	+4	+4	+5	+5	+5	+5	+6
	Ll - Mm	**Increase** 2 units/kg/hour For VTE consider 40 units/kg bolus dose	+2	+2	+2	+2	+2	+3	+3	+3	+3	+3	+4	+4
	Nn - Pp	**No Change**	Remeasure aPTT within 24 hours (or next morning)											
	Qq - Rr	**Reduce** 1 unit/kg/hour	−1	−1	−1	−1	−1	−1	−1	−2	−2	−2	−2	−2
	Ss - Tt	**Hold 30 minutes** Then reduce 2 units/kg/hour	−2	−2	−2	−2	−2	−3	−3	−3	−3	−3	−4	−4
	> Zz	• Contact doctor • Hold 60 minutes • Then reduce 3 units/kg/hour	−2	−3	−3	−3	−4	−4	−4	−5	−5	−5	−5	−6

Slight variances of aPTT ranges may occur due to changes in laboratory reagents used. Please check with your Pathology Laboratory.

RECOMMENDATIONS FOR SUBCUTANEOUS UNFRACTIONATED HEPARIN (UFH)

Dosing	***VTE prophylaxis:*** 5000 units bd (0600 & 1800) ***High Risk Thromboembolism:*** 5000 units tds (0600,1200,1800)
Withholding subcutaneous Unfractionated Heparin	• Withhold heparin a minimum of 6 to 8 hours prior to intervention. • Interventional (surgical) procedure: may commence prophylactic doses 2 hours after procedure.
Monitoring	• Full blood count: Measure platelets at baseline and at least twice weekly. Medical review if platelets less than 50 x 10⁹/L.

RECOMMENDATIONS FOR LOW MOLECULAR WEIGHT HEPARIN (LMWH)

Preferred administration times for twice daily dosing are 0600 and 1800 hr. Daily thromboprophylaxis should be given in the evening.

Enoxaparin Dosage and Frequency (Seek specialist advice in patients weighing < 40 kg and > 120 kg)

INDICATION	Normal renal function	Impaired renal function (CrCl < 30 mL/min)
VTE prophylaxis	40 mg once daily	20 mg once daily or consider alternative
DVT/PE treatment	1.5 mg/kg once daily OR 1 mg/kg twice daily	1 mg/kg once daily or consider alternative
Acute Coronary Syndrome/Cardiac Valves	1 mg/kg twice daily	1 mg/kg once daily or consider alternative

Dalteparin is commonly used for VTE treatment in cancer patients: dose 200 Units/kg daily subcutaneously for 30 days, then 150 Units/kg daily for 5 months. Total daily dose should not exceed 18,000 Units. Dose adjustment is required for renal impairment and thrombocytopenia. See prescribing guidelines.

Monitoring	• Baseline full blood count and U&Es. Measure platelets at baseline and at least twice weekly. Medical review if platelets less than 50 x 10⁹/L. • Seek specialist advice for monitoring anti-Xa, dose modification or alternative therapeutic options. • Consider anti-Xa levels for patients on high doses, and in obese, pregnant, renal impairment and frail elderly patients.
Reversing Overtreatment	• Seek specialist advice as protamine sulfate only partially neutralises low molecular weight heparin. Only consider protamine sulfate if LMWH has been given within the last 12 hours. • Check hospital guidelines for more detailed advice on protamine sulfate use. As a guide: Give 1 mg protamine sulfate per 1 mg enoxaparin (maximum 50 mg as a single dose). • Administer initial dose (up to 50 mg) by slow IV push (over 10 minutes) and remaining dose by intravenous infusion (maximum infusion rate 5 mg/minute). Reassess the patient and the aPTT in 2-4 hours and consider a repeat dose if the patient is still bleeding or the aPTT remains prolonged.

Prescribing anticoagulant agents

When prescribing anticoagulant agents, it is important to first check for:

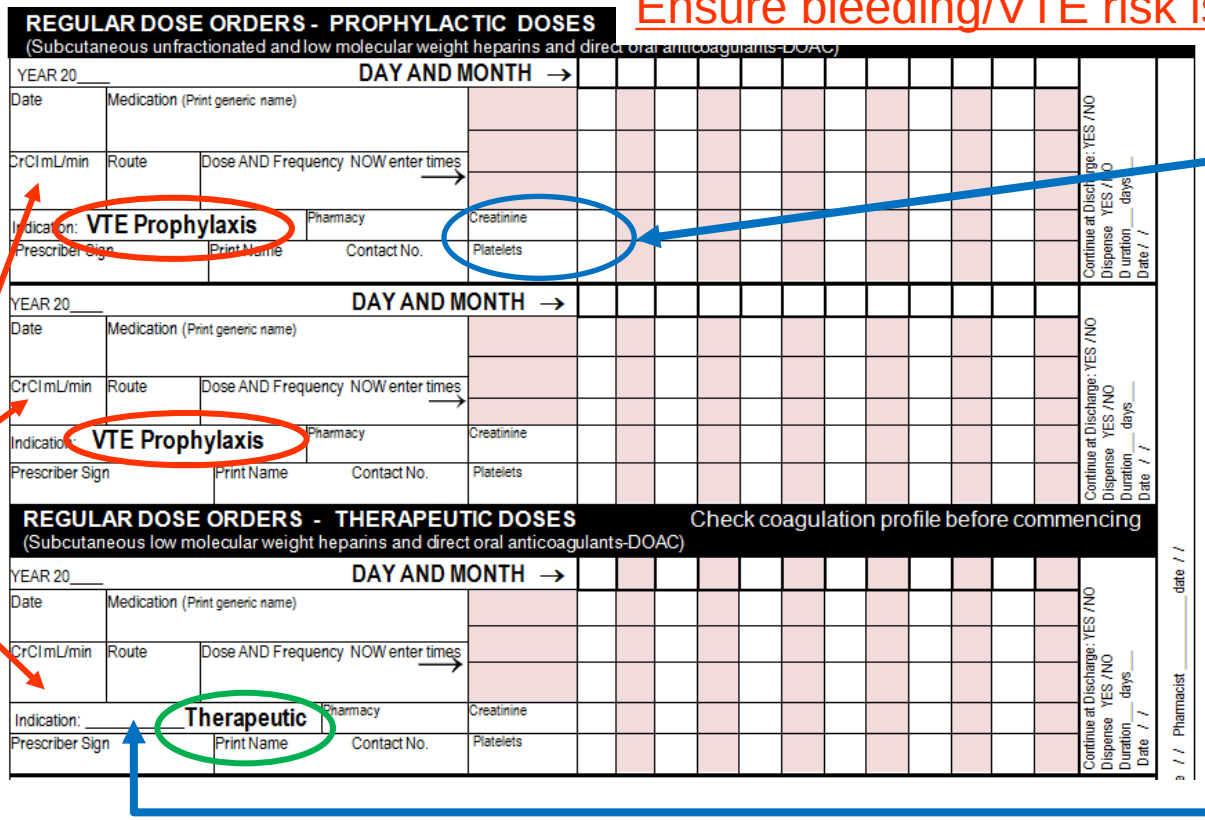
- co-existing conditions,
- past history of anticoagulant related adverse events and
- concomitant therapy

- These may influence the decision to prescribe a particular anticoagulant or indicate a need for closer monitoring and/or dose adjustment.
- The “Bleeding Risk considered before prescribing anticoagulants” prompt is on the front of the WA AMC.

- The prescriber MUST complete this section.
- Please refer to local Venous Thromboembolism (VTE) guidelines for bleeding risk assessment.

Regular dose orders

DATE AND MONTH for each separate order
Ensure bleeding/VTE risk is reassessed



Record creatinine and platelets results

Calculate and record Creatinine Clearance

Document the indication here e.g., AF, DVT, PE

This section is used for regular dose orders for anticoagulants including:

- Subcutaneous unfractionated heparin
- Subcutaneous enoxaparin or dalteparin dosing based on indication and the patient's renal function and weight.
- Direct oral anticoagulant (eg apixaban, dabigatran and rivaroxaban are to be prescribed in this section of the chart depending on indication).

Example of Correct Use of Regular Dose Order Section

If the anticoagulant is the same and there is no change in indication, you can continue the prescription order on the consecutive line as shown below:

REGULAR DOSE ORDERS - PROPHYLACTIC DOSES Check platelets and coagulation profile before commencing
(Subcutaneous unfractionated and low molecular weight heparins and direct oral anticoagulants - DOACs)

YEAR 2022					DAY AND MONTH →
Date: 4/8	Medicine (Print generic name): Enoxaparin				
CrCl mL/min: 28	Route: subcut	Dose AND Frequency NOW enter times →: 20mg daily			
Indication: VTE Prophylaxis		Pharmacy: A.B 4/8			
Prescriber Sign: A. Medic		Print Name: A.Medic	Contact No.: pager 1234		

	4/8	5/8	6/8	7/8	8/8	9/8	10/8	11/8	12/8	13/8	14/8	15/8
1800	AD	CT	CT	CT	PL	PL	PL	AD	PL	ZA	CT	ZA
Creatinine	122							132				
Platelets	213							206				

Continue at Discharge: YES / NO
Dispense YES / NO
Duration: ____ days. Qty: ____

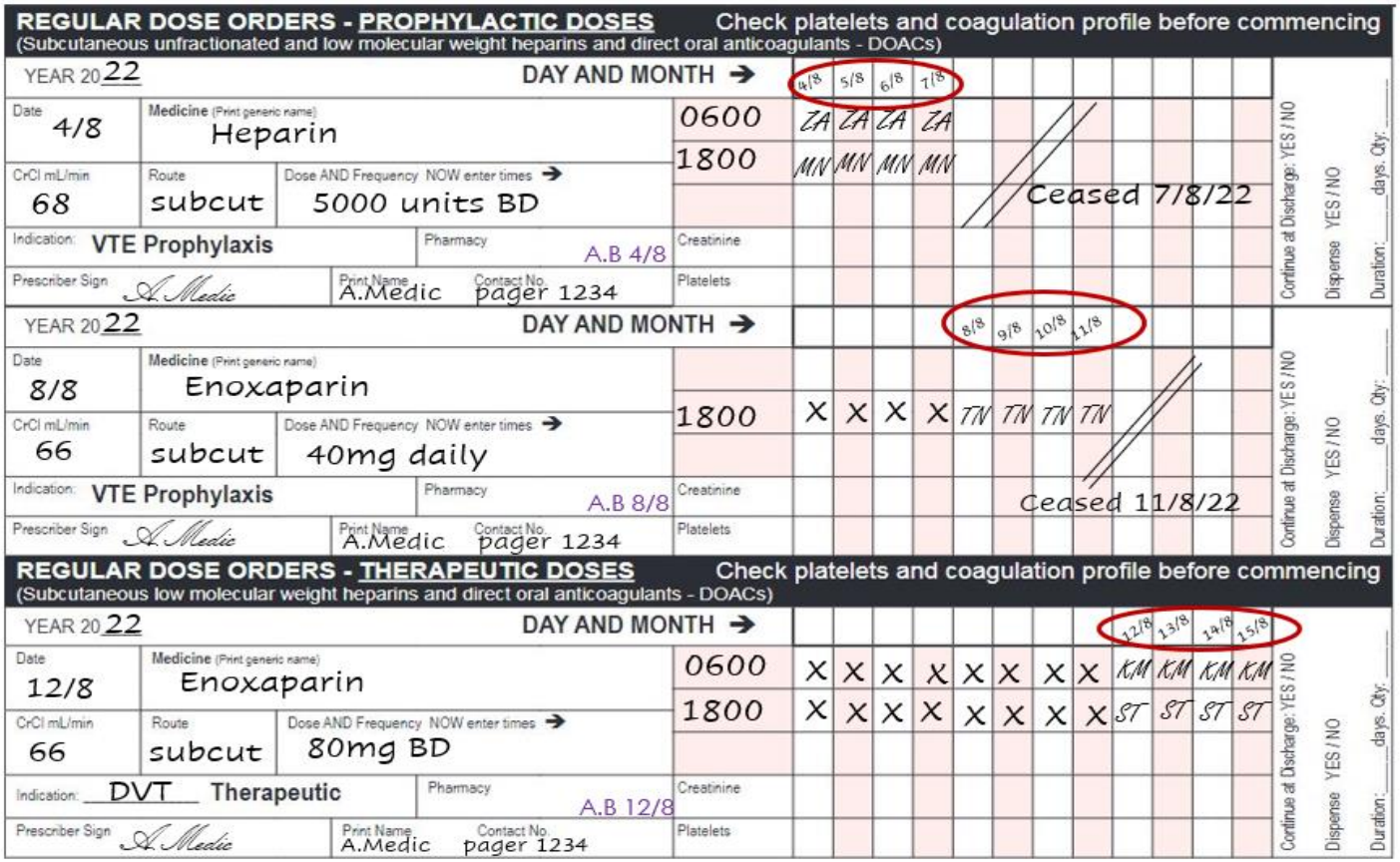
YEAR 2022					DAY AND MONTH →
Date: 16/8	Medicine (Print generic name): Enoxaparin				
CrCl mL/min: 28	Route: subcut	Dose AND Frequency NOW enter times →: 20mg daily			
Indication: VTE Prophylaxis		Pharmacy: A.B 16/8			
Prescriber Sign: A. Medic		Print Name: A.Medic	Contact No.: pager 1234		

	16/8	17/8	18/8	19/8	20/8	21/8	22/8	23/8	24/8	25/8	26/8	27/8
1800	ZA	AD	ZA	AD	CT	KF	KF	KF	KF	AD	MN	MN
Creatinine			98									
Platelets			224									

Continue at Discharge: YES / NO
Dispense YES / NO
Duration: ____ days. Qty: ____

Example of Correct Use of Regular Dose Order Section

When changing the anticoagulant agent or the indication, the day and month must be carried in the corresponding column across the order as shown below:



REGULAR DOSE ORDERS - PROPHYLACTIC DOSES Check platelets and coagulation profile before commencing
(Subcutaneous unfractionated and low molecular weight heparins and direct oral anticoagulants - DOACs)

YEAR 2022 — DAY AND MONTH → 4/8, 5/8, 6/8, 7/8

Date	Medicine (Print generic name)	0600	1800
4/8	Heparin	ZA ZA ZA ZA	MN MN MN MN

CrCl mL/min: 68 | Route: subcut | Dose AND Frequency NOW enter times →: 5000 units BD

Ceased 7/8/22

Indication: VTE Prophylaxis | Pharmacy: A.B 4/8 | Creatinine

Prescriber Sign: A.Medic | Print Name: A.Medic | Contact No.: pager 1234 | Platelets

Continue at Discharge: YES / NO | Dispense YES / NO | Duration: ____ days. Qty: ____

YEAR 2022 — DAY AND MONTH → 8/8, 9/8, 10/8, 11/8

Date	Medicine (Print generic name)	1800
8/8	Enoxaparin	X X X X TN TN TN TN

CrCl mL/min: 66 | Route: subcut | Dose AND Frequency NOW enter times →: 40mg daily

Ceased 11/8/22

Indication: VTE Prophylaxis | Pharmacy: A.B 8/8 | Creatinine

Prescriber Sign: A.Medic | Print Name: A.Medic | Contact No.: pager 1234 | Platelets

Continue at Discharge: YES / NO | Dispense YES / NO | Duration: ____ days. Qty: ____

REGULAR DOSE ORDERS - THERAPEUTIC DOSES Check platelets and coagulation profile before commencing
(Subcutaneous low molecular weight heparins and direct oral anticoagulants - DOACs)

YEAR 2022 — DAY AND MONTH → 12/8, 13/8, 14/8, 15/8

Date	Medicine (Print generic name)	0600	1800
12/8	Enoxaparin	X X X X X X X X KM KM KM KM	X X X X X X X X ST ST ST ST

CrCl mL/min: 66 | Route: subcut | Dose AND Frequency NOW enter times →: 80mg BD

Indication: DVT Therapeutic | Pharmacy: A.B 12/8 | Creatinine

Prescriber Sign: A.Medic | Print Name: A.Medic | Contact No.: pager 1234 | Platelets

Continue at Discharge: YES / NO | Dispense YES / NO | Duration: ____ days. Qty: ____

Recommendations for Low Molecular Weight Heparin (LMWH)

- Dosing of LMWH (enoxaparin and dalteparin) is based on the indication, risk of bleeding risk and modifying factors (e.g. renal function and patient weight).
- Dose modification of these drugs is required when the creatinine clearance (CrCl or GFR) is less than 30mL/min.

RECOMMENDATIONS FOR SUBCUTANEOUS UNFRACTIONATED HEPARIN (UFH)	
Dosing	***VTE prophylaxis*:** 5000 units bd (0600 & 1800) ***High Risk Thromboembolism:*** 5000 units tds (0600,1200,1800)
Withholding subcutaneous Unfractionated Heparin	• Withhold heparin a minimum of 6 to 8 hours prior to intervention. • Interventional (surgical) procedure: may commence prophylactic doses 2 hours after procedure.
Monitoring	• Full blood count: Measure platelets at baseline and at least twice weekly. Medical review if platelets less than 50 x 10^9/L.

RECOMMENDATIONS FOR LOW MOLECULAR WEIGHT HEPARIN (LMWH)		
Preferred administration times for twice daily dosing are 0600 and 1800 hr. Daily thromboprophylaxis should be given in the evening.		
Enoxaparin Dosage and Frequency (Seek specialist advice in patients weighing < 40 kg and > 120 kg)		
INDICATION	**Normal renal function**	**Impaired renal function** (CrCl < 30 mL/min)
VTE prophylaxis	40 mg once daily	20 mg once daily or consider alternative
DVT/PE treatment	1.5 mg/kg once daily OR 1 mg/kg twice daily	1 mg/kg once daily or consider alternative
Acute Coronary Syndrome/Cardiac Valves	1 mg/kg twice daily	1 mg/kg once daily or consider alternative
Dalteparin is commonly used for VTE treatment in cancer patients: dose 200 Units/kg daily subcutaneously for 30 days, then 150 Units/kg daily for 5 months. Total daily dose should not exceed 18,000 Units. Dose adjustment is required for renal impairment and thrombocytopenia. See prescribing guidelines.		
Monitoring	• Baseline full blood count and U&Es. Measure platelets at baseline and at least twice weekly. Medical review if platelets less than 50 x 10^9/L. • Seek specialist advice for monitoring anti-Xa, dose modification or alternative therapeutic options. • Consider anti-Xa levels for patients on high doses, and in obese, pregnant, renal impairment and frail elderly patients.	
Reversing Overtreatment	• Seek specialist advice as protamine sulfate only partially neutralises low molecular weight heparin. Only consider protamine sulfate if LMWH has been given within the last 12 hours. • Check hospital guidelines for more detailed advice on protamine sulfate use. As a guide: Give 1 mg protamine sulfate per 1 mg enoxaparin (maximum 50 mg as a single dose). • Administer initial dose (up to 50 mg) by slow IV push (over 10 minutes) and remaining dose by intravenous infusion (maximum infusion rate 5 mg/minute). Reassess the patient and the aPTT in 2-4 hours and consider a repeat dose if the patient is still bleeding or the aPTT remains prolonged.	

Recommendations for LMWH

- Routine monitoring of residual anti-Xa activity as a measure of LMWH therapy is not required.
- However, in the case of patients at high risk of bleeding, obese patients, patients on high doses, pregnant, renal impairment and frail elderly patients, anti-factor Xa monitoring may be appropriate.
- While the risk of heparin induced thrombocytopenia (HIT) is lower with LMWH than unfractionated heparin, screening for HIT with a platelet count at day 5 of therapy is recommended.

Prescribing Intravenous Unfractionated Heparin (UFH)

- **Initial order** – prescriber should complete order (initial bolus and initial infusion rate) on page 2 of chart.
- **Maintenance** – prescriber to indicate whether nurse should maintain infusion rate based on nomogram as indicated OR whether prescriber is to be contacted
- **It is important, especially for serious pulmonary embolism (PE), that a bolus dose of UFH is prescribed and administered on initiating UFH infusion to ensure that the therapeutic range is reached within the first 24 hours of therapy**

Heparin Infusion Nomogram

Venous Thromboembolism (DVT/PE) Bolus and Initial Rate Requirements

		Weight Based Guide For Initial Dose										
	Weight	≤ 40 kg	45 kg	50 kg	55 kg	60 kg	65 kg	70 kg	75 kg	80 kg	85 kg	9
Bolus Dose 80 units/kg	Units	3200	3600	4000	4400	4800	5200	5600	6000	6400	6800	7
Initial Rate 18 units/kg/hour	Rate (mL/hour)	14	16	18	20	22	23	25	27	29	31	

Acute Coronary Syndrome Bolus and Initial Rate Requirements

		Weight Based Guide For Initial Dose											
	Weight	≤ 40 kg	45 kg	50 kg	55 kg	60 kg	65 kg	70 kg	75 kg	80 kg	85 kg	90 kg	≥ 95 kg
Bolus Dose 60 units/kg	Units	2400	2800	3000	3300	3600	4000	4000	4000	4000	4000	4000	4000
Initial Rate 12 units/kg/hour	Rate (mL/hour)	10	11	12	13	14	15	17	19	20	20	20	20

Nomogram for modifying rate of administration for Venous Thromboembolism and Acute Coronary Syndrome

MAINTENANCE ORDER

		Weight Based Rate For Maintenance Dose											
	Weight	≤ 40 kg	45 kg	50 kg	55 kg	60 kg	65 kg	70 kg	75 kg	80 kg	85 kg	90 kg	≥ 95 kg
MAINTENANCE	aPTT / Dose Adjustment (Use weight column on nomogram and row for aPTT range for mL/hour conversion of unit/kg/hour)	Rate Change (mL/hour) — This rate equals recommended change in units/hour for a 50 unit/mL dilution. Remeasure aPTT within 6 hours of each rate change.											
	≤50 — **Bolus dose** as per indication (VTE OR ACS listed above) Then **increase** 3 units/kg/hour	+2	+3	+3	+3	+4	+4	+4	+5	+5	+5	+5	+6
	51-69 — **Increase** 2 units/kg/hour For VTE consider 40 units/kg bolus dose	+2	+2	+2	+2	+2	+3	+3	+3	+3	+3	+4	+4
	70-95 — **No Change**	Remeasure aPTT within 24 hours (or next morning)											
	96-110 — **Reduce** 1 unit/kg/hour	−1	−1	−1	−1	−1	−1	−1	−2	−2	−2	−2	
	111-120 — **Hold 30 minutes** Then reduce 2 units/kg/hour	−2	−2	−2	−2	−2	−3	−3	−3	−3	−3	−4	
	>120 — • Contact doctor • Hold 60 minutes • Then reduce 3 units/kg/hour	−2	−3	−3	−3	−4	−4	−4	−5	−5	−5	−5	

Slight variances of aPTT ranges may occur due to changes in laboratory reagents used. Please check with your Pathology Laboratory.

Initial dose will vary depending on the indication – VTE or ACS

Maintenance order will depend on patients weight and aPTT level

aPTT ranges in above nomogram are an EXAMPLE ONLY to illustrate use of chart in following slides. Please check with your Pathology Laboratory for aPTT ranges for your hospital

Intravenous Infusions

e.g. for patient with Venous Thromboembolism (VTE)

INTRAVENOUS PRESCRIPTION ORDER

Prescriber to complete. A new prescription is required if the order (total dose, fluid or volume) is changed)

Target aPTT: 70-95

Indication: ☑ VTE ☐ Acute Coronary Syndrome (ACS) ☐ Other (specify)

Weight: 74 kg

Date	Drug	Total dose (units)	Fluid	Volume (mL)	Signature	Print Name	Contact
31/8	HEPARIN	25,000 units	0.9% SODIUM CHLORIDE	500 mL	A. Doctor	A.Doctor	4025

INITIAL BOLUS DOSE AND INITIAL INFUSION RATE Prescriber to complete ORDER

Date	Baseline aPTT	Date/Time of dose	Initial Bolus (units)	Initial Infusion Rate (mL/hour)	Prescriber		Nurse	
					Signature	Print Name	Time	N1 / N2
31/8	42	31/8/22 0200	6000 units	27mL/hr	A. Doctor	A.Doctor	1430	SR / DA

MAINTENANCE INFUSION RATE CHANGES AND BOLUS DOSES

Prescriber to complete order ☐ Prescriber to be contacted following each aPTT test

☑ Nursing staff to adjust dose based on nomogram using 75 kg column

Date	Prescriber signature	Print Name	Contact	Pharmacy
31/8/22	A. Doctor	A.Doctor	4025	P.Harmacist

Heparin Infusion Nomogram use for VTE

Venous Thromboembolism (DVT/PE) Bolus and Initial Rate Requirements

		Weight Based Guide For Initial Dose											
	Weight	≤ 40 kg	45 kg	50 kg	55 kg	60 kg	65 kg	70 kg	75 kg	80 kg	85 kg	90 kg	≥ 95 kg
Bolus Dose 80 units/kg	Units	3200	3600	4000	4400	4800	5200	5600	6000	6400	6800	7200	7200
Initial Rate 18 units/kg/hour	Rate (mL/hour)	14	16	18	20	22	23	25	27	29	31	32	32

Acute Coronary Syndrome Bolus and Initial Rate Requirements

		Weight Based Guide For Initial Dose											
	Weight	≤ 40 kg	45 kg	50 kg	55 kg	60 kg	65 kg	70 kg	75 kg	80 kg	85 kg	90 kg	≥ 95 kg
Bolus Dose 60 units/kg	Units	2400	2800	3000	3300	3600	4000	4000	4000	4000	4000	4000	4000
Initial Rate 12 units/kg/hour	Rate (mL/hour)	10	11	12	13	14	15	17	19	20	20	20	20

Nomogram for modifying rate of administration for Venous Thromboembolism and Acute Coronary Syndrome

MAINTENANCE ORDER			Weight Based Rate For Maintenance Dose											
		Weight	≤ 40 kg	45 kg	50 kg	55 kg	60 kg	65 kg	70 kg	75 kg	80 kg	85 kg	90 kg	≥ 95 kg
MAINTENANCE	aPTT	**Dose Adjustment** Use weight column on nomogram and row for aPTT range for mL/hour conversion of unit/kg/hour	**Rate Change (mL/hour)** This rate equals recommended change in units/hour for a 50 unit/mL dilution. Remeasure aPTT within 6 hours of each rate change.											
	≤ 50	**Bolus dose** as per indication (VTE OR ACS listed above) Then **increase** 3 units/kg/hour	+ 2	+ 3	+ 3	+ 3	+ 4	+ 4	+ 4	+ 5	+ 5	+ 5	+ 5	+ 6
	51-69	**Increase** 2 units/kg/hour For VTE consider 40 units/kg bolus dose	+ 2	+ 2	+ 2	+ 2	+ 2	+ 3	+ 3	+ 3	+ 3	+ 3	+ 4	+ 4
	70-95	**No Change**	Remeasure aPTT within 24 hours (or next morning)											
	96-110	**Reduce** 1 unit/kg/hour	– 1	– 1	– 1	– 1	– 1	– 1	– 1	– 2	– 2	– 2	– 2	– 2
	111-120	**Hold 30 minutes** Then reduce 2 units/kg/hour	– 2	– 2	– 2	– 2	– 2	– 3	– 3	– 3	– 3	– 3	– 4	– 4
	>120	• Contact doctor • Hold 60 minutes • Then reduce 3 units/kg/hour	– 2	– 3	– 3	– 3	– 4	– 4	– 4	– 5	– 5	– 5	– 5	– 6

Slight variances of aPTT ranges may occur due to changes in laboratory reagents used. Please check with your Pathology Laboratory.

aPTT ranges in above nomogram are an EXAMPLE ONLY to illustrate use of chart in following slides. Please check with your Pathology Laboratory for aPTT ranges for your hospital

Maintaining the infusion regimen using the weight-based nomogram and weight-based guide

aPTT test			Bolus and infusion rate administration									
Date	Time Taken	aPTT	Time	IV bolus (units)	Bolus (Sign)	Hold (minutes)	Time stopped	Hold (Sign)	Time started	New Rate (mL / hour)	Rate (Sign)	Prescriber Sign
31/8			0800	6000	AL MC				0800	27	KC JK	
31/8	1400	90							1430	27	KF MG	
1/9	1400	62	1430	3000	DA SW				1430	30	DA SW	
1/9	2000	85							2030	30	KW SU	
2/9	2000	109							2030	28	CP MR	
3/9	0400	125				60 minutes	0430		0530	23	CP MR	

INFUSION CEASED:	Date	Time	Prescriber signature	Print Name	Contact	Pharmacy

INFUSION BAG CHANGES Nursing staff to document each new bag. Infusion should only be interrupted when indicated by aPTT

Date	Time Commenced	Checked	Given	Time Completed	Volume Infused	Date	Time Commenced	Checked	Given	Time Completed	Volume Infused

27 + 3

30 - 2

28 - 5

1. Contact Doctor
2. Withhold infusion for 60 minutes
3. Reduce rate by 3 units/kg/hour, which is 5mL/hour as per nomogram= 23mL/hour

Maintenance regimen IV Heparin Continuous infusion

- Should only be stopped when indicated by nomogram or as directed by the prescriber.
- aPTT should be checked
  - within 6 hours of every rate change

    OR
  - within 24 hours (next morning) – when aPTT within target range
- There should be a prompt dose adjustment to each aPTT measurement
- The infusion should be continuous – only stop when indicated by aPTT (nomogram)
- Prescriber should always be contacted for EXTREME aPTT levels
- In all cases the prescriber should frequently check the aPTT result and subsequent infusion rate changes
- It is recommended that bolus doses be drawn up (as prescribed) from a separate ampoule into a syringe for administration.

Fluid Restricted Patients

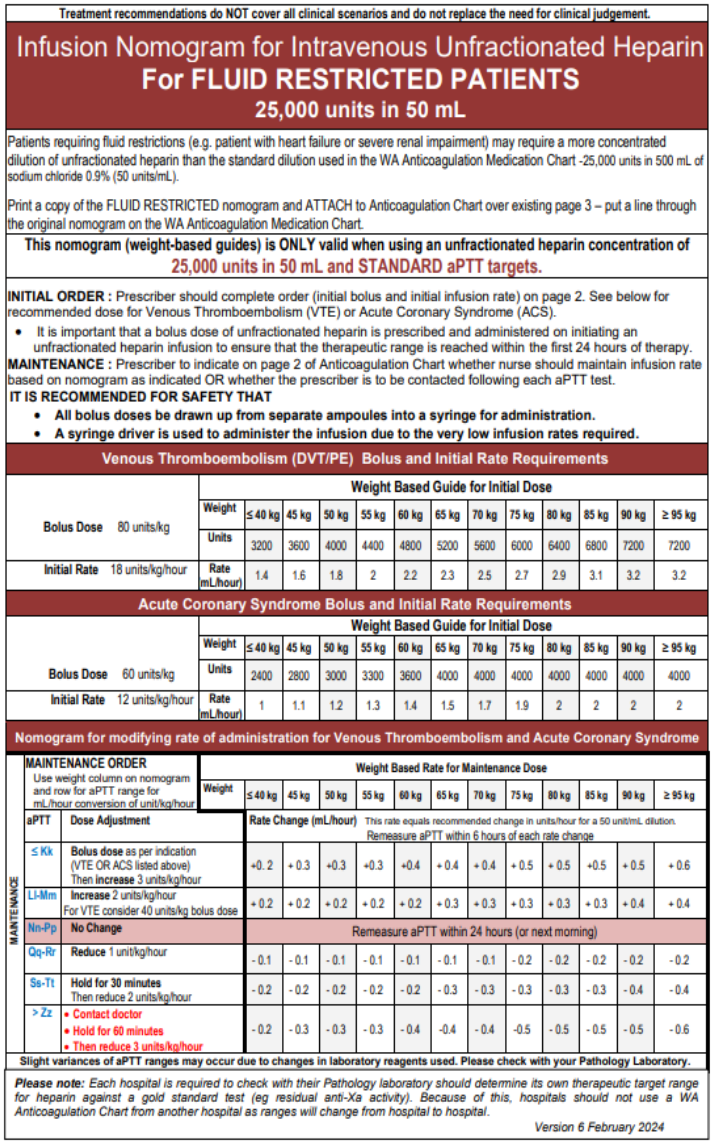
- Renal failure and heart failure
- 25,000 units in 50mL nomogram available
- Watch rate changes
- 10x difference to normal nomograms
- Print and attach to WA Anticoagulation Chart (WA AMC)

Heparin Infusions

- Important to make sure correct dilution used
- Standard dilution 25,000 units in 500mL on WA AMC
- **Fluid Restricted Patients** 25,000 units in 50mL

✱ Not all sites will require a fluid restricted nomogram

- Different nomograms required – 10x rate errors
- Monitoring and rate adjustment important for safe management



Treatment recommendations do NOT cover all clinical scenarios and do not replace the need for clinical judgement.

Infusion Nomogram for Intravenous Unfractionated Heparin
For FLUID RESTRICTED PATIENTS
25,000 units in 50 mL

Patients requiring fluid restrictions (e.g. patient with heart failure or severe renal impairment) may require a more concentrated dilution of unfractionated heparin than the standard dilution used in the WA Anticoagulation Medication Chart -25,000 units in 500 mL of sodium chloride 0.9% (50 units/mL).

Print a copy of the FLUID RESTRICTED nomogram and ATTACH to Anticoagulation Chart over existing page 3 – put a line through the original nomogram on the WA Anticoagulation Medication Chart.

This nomogram (weight-based guides) is ONLY valid when using an unfractionated heparin concentration of 25,000 units in 50 mL and STANDARD aPTT targets.

INITIAL ORDER : Prescriber should complete order (initial bolus and initial infusion rate) on page 2. See below for recommended dose for Venous Thromboembolism (VTE) or Acute Coronary Syndrome (ACS).

- It is important that a bolus dose of unfractionated heparin is prescribed and administered on initiating an unfractionated heparin infusion to ensure that the therapeutic range is reached within the first 24 hours of therapy.

MAINTENANCE : Prescriber to indicate on page 2 of Anticoagulation Chart whether nurse should maintain infusion rate based on nomogram as indicated OR whether the prescriber is to be contacted following each aPTT test.

IT IS RECOMMENDED FOR SAFETY THAT

- **All bolus doses be drawn up from separate ampoules into a syringe for administration.**
- **A syringe driver is used to administer the infusion due to the very low infusion rates required.**

Venous Thromboembolism (DVT/PE) Bolus and Initial Rate Requirements

		Weight Based Guide for Initial Dose											
	Weight	≤ 40 kg	45 kg	50 kg	55 kg	60 kg	65 kg	70 kg	75 kg	80 kg	85 kg	90 kg	≥ 95 kg
Bolus Dose 80 units/kg	Units	3200	3600	4000	4400	4800	5200	5600	6000	6400	6800	7200	7200
Initial Rate 18 units/kg/hour	Rate (mL/hour)	1.4	1.6	1.8	2	2.2	2.3	2.5	2.7	2.9	3.1	3.2	3.2

Acute Coronary Syndrome Bolus and Initial Rate Requirements

		Weight Based Guide for Initial Dose											
	Weight	≤ 40 kg	45 kg	50 kg	55 kg	60 kg	65 kg	70 kg	75 kg	80 kg	85 kg	90 kg	≥ 95 kg
Bolus Dose 60 units/kg	Units	2400	2800	3000	3300	3600	4000	4000	4000	4000	4000	4000	4000
Initial Rate 12 units/kg/hour	Rate (mL/hour)	1	1.1	1.2	1.3	1.4	1.5	1.7	1.9	2	2	2	2

Nomogram for modifying rate of administration for Venous Thromboembolism and Acute Coronary Syndrome

MAINTENANCE ORDER Use weight column on nomogram and row for aPTT range for mL/hour conversion of unit/kg/hour		Weight Based Rate for Maintenance Dose											
	Weight	≤ 40 kg	45 kg	50 kg	55 kg	60 kg	65 kg	70 kg	75 kg	80 kg	85 kg	90 kg	≥ 95 kg
aPTT	Dose Adjustment	Rate Change (mL/hour) This rate equals recommended change in units/hour for a 50 unit/mL dilution. Remeasure aPTT within 6 hours of each rate change											
≤ Kk	**Bolus dose** as per indication (VTE OR ACS listed above) Then **increase** 3 units/kg/hour	+0. 2	+ 0.3	+0.3	+0.3	+0.4	+ 0.4	+ 0.4	+ 0.5	+ 0.5	+0.5	+ 0.5	+ 0.6
Ll-Mm	**Increase** 2 units/kg/hour For VTE consider 40 units/kg bolus dose	+ 0.2	+ 0.2	+ 0.2	+ 0.2	+ 0.2	+ 0.3	+ 0.3	+ 0.3	+ 0.3	+ 0.3	+ 0.4	+ 0.4
Nn-Pp	**No Change**	Remeasure aPTT within 24 hours (or next morning)											
Qq-Rr	**Reduce** 1 unit/kg/hour	- 0.1	- 0.1	- 0.1	- 0.1	- 0.1	- 0.1	- 0.1	- 0.2	- 0.2	- 0.2	- 0.2	- 0.2
Ss-Tt	**Hold for 30 minutes** Then reduce 2 units/kg/hour	- 0.2	- 0.2	- 0.2	- 0.2	- 0.2	- 0.3	- 0.3	- 0.3	- 0.3	- 0.3	- 0.4	- 0.4
> Zz	• **Contact doctor** • **Hold for 60 minutes** • **Then reduce 3 units/kg/hour**	- 0.2	- 0.3	- 0.3	- 0.3	- 0.4	-0.4	- 0.4	-0.5	- 0.5	- 0.5	- 0.5	- 0.6

Slight variances of aPTT ranges may occur due to changes in laboratory reagents used. Please check with your Pathology Laboratory.

***Please note:** Each hospital is required to check with their Pathology laboratory should determine its own therapeutic target range for heparin against a gold standard test (eg residual anti-Xa activity). Because of this, hospitals should not use a WA Anticoagulation Chart from another hospital as ranges will change from hospital to hospital.*

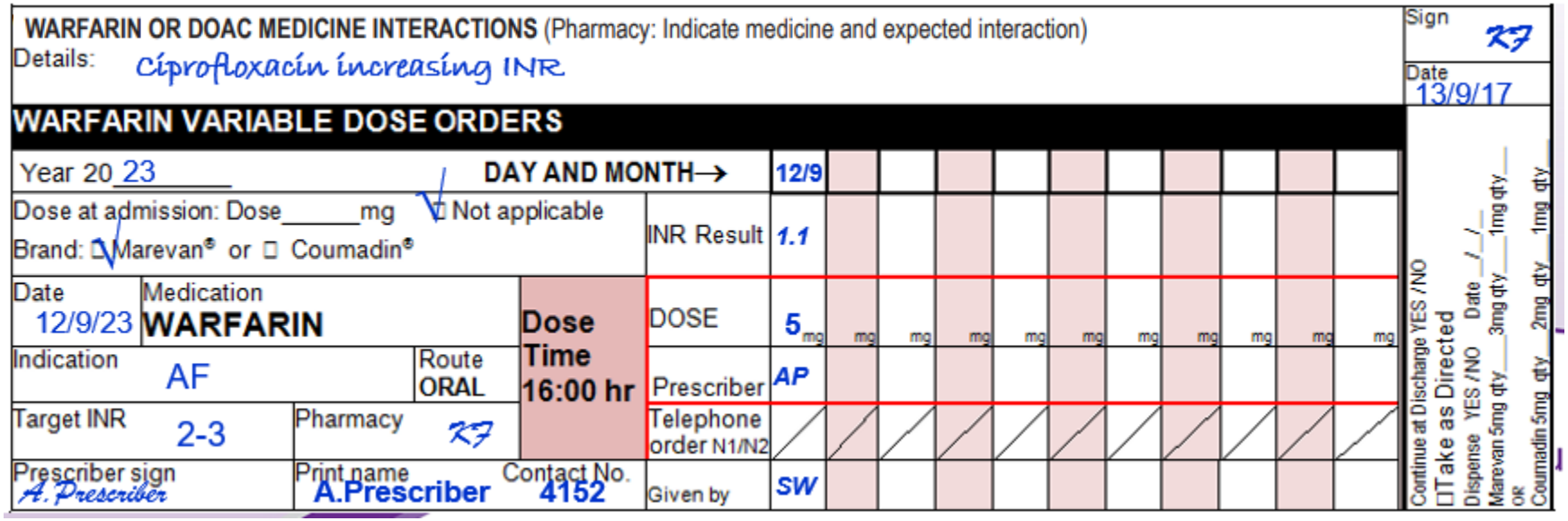
Version 6 February 2024

Reported Heparin Infusion Issues

- Wrong rate due to using the incorrect nomogram
- Be aware that ICU may have a different dilution they use for renal perfusion, if this is the case then a new prescription on the WA AMC must be initiated and a new infusion solution must be used.
- Accidentally pushing through a large volume when not required (often occurs when ‘pushing’ through volume of infusion bag rather than drawing up into a syringe for a push).
- Not monitoring aPTT and changing rate in accordance with aPTT results has led to sub-therapeutic and supra-therapeutic heparin management
- Not administering a bolus dose when required by nomogram for low aPTT values resulting in sub-therapeutic heparin management

Warfarin

- The following is to be documented:
  - INR results
  - daily warfarin dose & prescriber's initials prior to 1600hrs according to the most recent INR
  - indication & target INR range
  - brand of warfarin to be used
  - initials of administering and checking nurses/midwives



WARFARIN OR DOAC MEDICINE INTERACTIONS (Pharmacy: Indicate medicine and expected interaction)
Details: Ciprofloxacin increasing INR
Sign KJ
Date 13/9/17

WARFARIN VARIABLE DOSE ORDERS

Year 20 23 | DAY AND MONTH→ | 12/9

Dose at admission: Dose _____ mg ☐ Not applicable
Brand: ☐ Marevan® or ☐ Coumadin®

INR Result: 1.1

Date: 12/9/23 | Medication: WARFARIN | Dose Time: 16:00 hr

DOSE: 5 mg

Indication: AF | Route: ORAL

Prescriber: AP

Target INR: 2-3 | Pharmacy: KJ

Telephone order N1/N2

Prescriber sign: A. Prescriber | Print name: A.Prescriber | Contact No.: 4152

Given by: SW

Continue at Discharge YES / NO
☐ Take as Directed
Dispense YES / NO Date __/__/__
Marevan 5mg qty___ 3mg qty___ 1mg qty___
OR
Coumadin 5mg qty___ 2mg qty___ 1mg qty___

Recommendations for Warfarin

- Page 4 of the WA AMC has recommendations for warfarin

RECOMMENDATIONS FOR WARFARIN		
Warfarin brands are NOT equivalent and cannot be used interchangeably.		
TARGET INR RANGE		
2 - 3	• Therapy for DVT or PE • Preventing DVT: high risk patients e.g. hip or knee surgery • Preventing systemic embolism: AF valvular heart disease, post MI, bioprosthetic heart valves (first 3 months)	
2 - 3	• Aortic bileaflet mechanical heart valve – if no other risk factors	
2.5 - 3.5	• Starr-Edwards mechanical heart valves. Mitral bileaflet mechanical heart valve or aortic if risk factors for thromboembolic event including AF, previous thromboembolism, LV dysfunction, hypercoagulable condition.	
(ADULT) DOSING FOR WARFARIN NAÏVE PATIENTS (TARGET INR 2 - 3)		**DOSING WITH ONGOING WARFARIN THERAPY**
Consider if bridging with heparin is indicated. Refer to local warfarin guidelines for further information. Record baseline FBC, coagulation status (INR, aPTT and PT) and liver function. • Suggested initial dosing of 5 mg daily for first 2 days, modify dosing for day 3 based on day 3 INR. • For younger patients (< 60 years) consider 7-10 mg on day 1 and day 2. • Consider smaller starting doses when the patient is elderly, has low body weight or abnormal liver function, is at high bleeding risk or has severe chronic renal impairment. • Consider dose modification in the presence of interacting medicines. • Discontinue heparin after a minimum of 5 days therapy and INR is 2 or greater.		• **Patients being re-initiated on warfarin post surgery/ intervention should be restarted on the dose prescribed prior to intervention and check INR day 3.** • In acutely ill patients with ongoing warfarin therapy: daily monitoring of INR may be appropriate. • Monitor INR more frequently when any change in treatment involves medicines known to interact with warfarin.

Best practice when initiating warfarin

- Consider if the benefits of anticoagulation outweigh the risks for each patient
- Measure baseline INR prior to starting therapy.
- For the majority of patients > 60 years a starting dose of 5mg for day 1 and day 2 is recommended, with dose modification tailored to INR on Day 3.
- For younger patients (< 60 years) consider 7-10mg on day 1 and day 2
- Consider smaller starting doses for high risk patients (elderly, low body weight, abnormal liver function or is at high bleeding risk)
- Consider dose modification in the presence of interacting drugs
- Warfarin doses should be modified based on the INR result.

Bridging with heparin

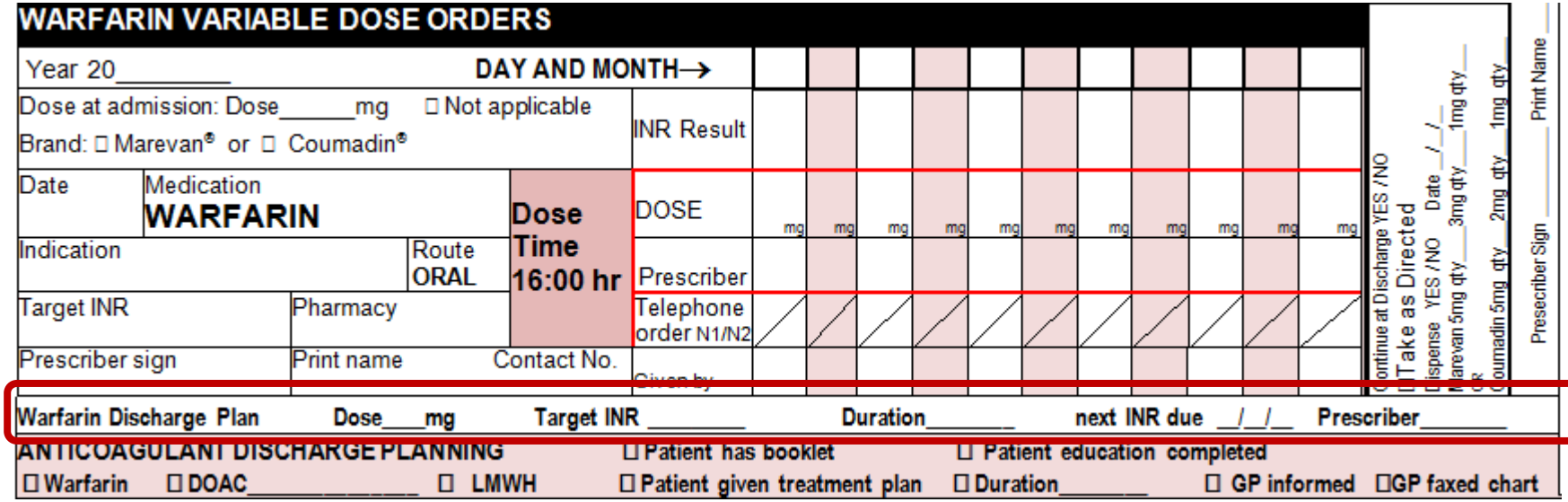
- Bridging with heparin is recommended for patients at high risk of thrombotic events.
- Acute treatment of venous thromboembolism (DVT or PE) should be treated with heparin (unfractionated or low molecular weight) for at least of 5 days and INR is > 2
- No heparin cover is required for patients at low risk of thrombosis

Ongoing warfarin therapy:

- Brand substitution is not allowed.
- Marevan® is the preferred brand for initiation.
- In acutely ill patients, daily monitoring of INR may be appropriate.
- Monitor INR more frequently when any change in treatment involves drugs known to interact with warfarin.
- Patients being re-initiated on warfarin post surgery/ procedure should be restarted on the dose prescribed prior to the intervention and check INR on day 3

Warfarin discharge planning

If a patient is being discharged on warfarin, this section will need to be completed by prescriber. This section of the **Discharge Treatment Plan** under the warfarin order section is specific for warfarin discharge



WARFARIN VARIABLE DOSE ORDERS

Year 20_____ **DAY AND MONTH→**

Dose at admission: Dose_____mg ☐ Not applicable

Brand: ☐ Marevan® or ☐ Coumadin®

INR Result

Date | Medication **WARFARIN** | **Dose Time 16:00 hr**

DOSE mg mg mg mg mg mg mg mg mg mg mg

Indication | Route ORAL

Prescriber

Target INR | Pharmacy

Telephone order N1/N2

Prescriber sign | Print name | Contact No.

Given by

Continue at Discharge YES /NO

☐Take as Directed

Dispense YES /NO Date __/__/__

Marevan 5mg qty___ 3mg qty___ 1mg qty___

OR

Coumadin 5mg qty___ 2mg qty___ 1mg qty___

Prescriber Sign _____ Print Name _____

Warfarin Discharge Plan Dose___mg Target INR _____ Duration_____ next INR due __/__/__ Prescriber_____

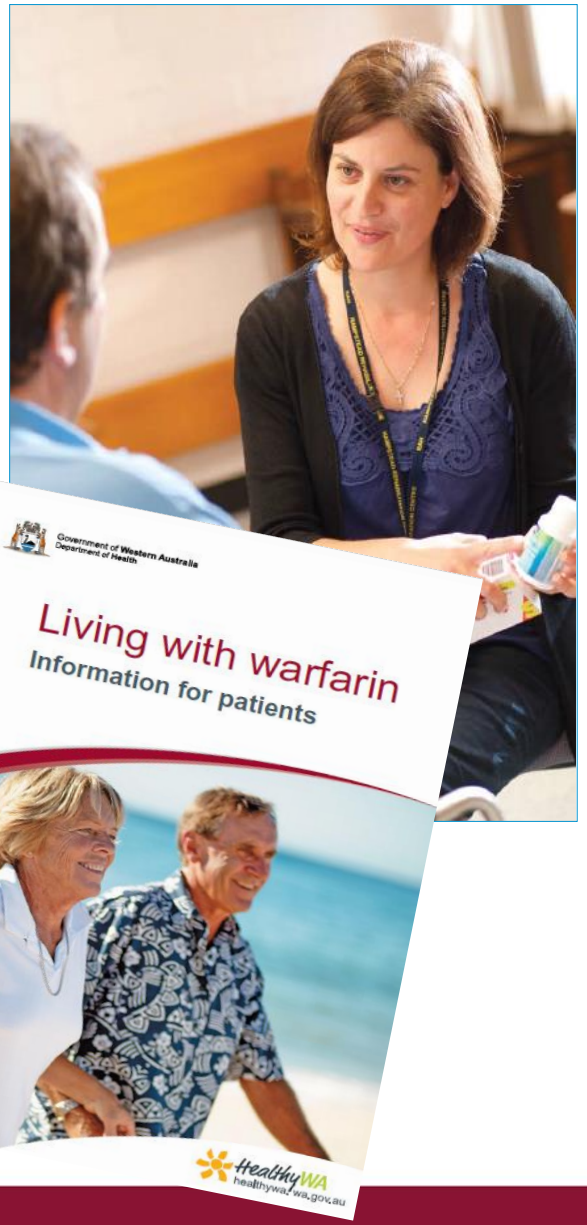
ANTICOAGULANT DISCHARGE PLANNING ☐ Patient has booklet ☐ Patient education completed

☐ Warfarin ☐ DOAC_____ ☐ LMWH ☐ Patient given treatment plan ☐ Duration_____ ☐ GP informed ☐GP faxed chart

Patient Information Warfarin

- Engage the patient and family in self-management of warfarin
  - highlight the importance of identifying & reporting signs of bleeding
  - provide verbal counselling and education booklets
  - highlight the importance of:
    - regular INR monitoring
    - Medicines and food/alcohol that interfere with the way warfarin works.

Medication safety resources DOH Website
https://www.health.wa.gov.au/~/media/Corp/Documents/Health-for/WATAG/Living-with-warfarin.pdf



Direct Oral Anticoagulants

- Direct Oral Anticoagulants (DOACs) are to be prescribed on the WA AMC.
- Prescribe in the Regular Dose Order section (either prophylaxis or treatment depending on indication)
- Prescribe with care in patients with poor renal function and elderly, underweight (< 50kg) or overweight (>150kg) patients.
- Idarucizumab is the reversal agent for dabigatran
  - Refer to local hospital guidelines
- Andexanet alpha is provisionally approved by the TGA as a reversal agent for apixaban and rivaroxaban. It is not listed on the Statewide Medicines Formulary and only available through local Drug/Medicine and Therapeutic Committee Individual Patient Approval for acute life-threatening bleeding.

Recommendations for DOACs

- Page 4 of the WA AMC has recommendations for DOACs

Treatment recommendations do not cover all clinical scenarios and do not replace the need for clinical judgement

RECOMMENDATIONS FOR DIRECT ORAL ANTICOAGULANTS

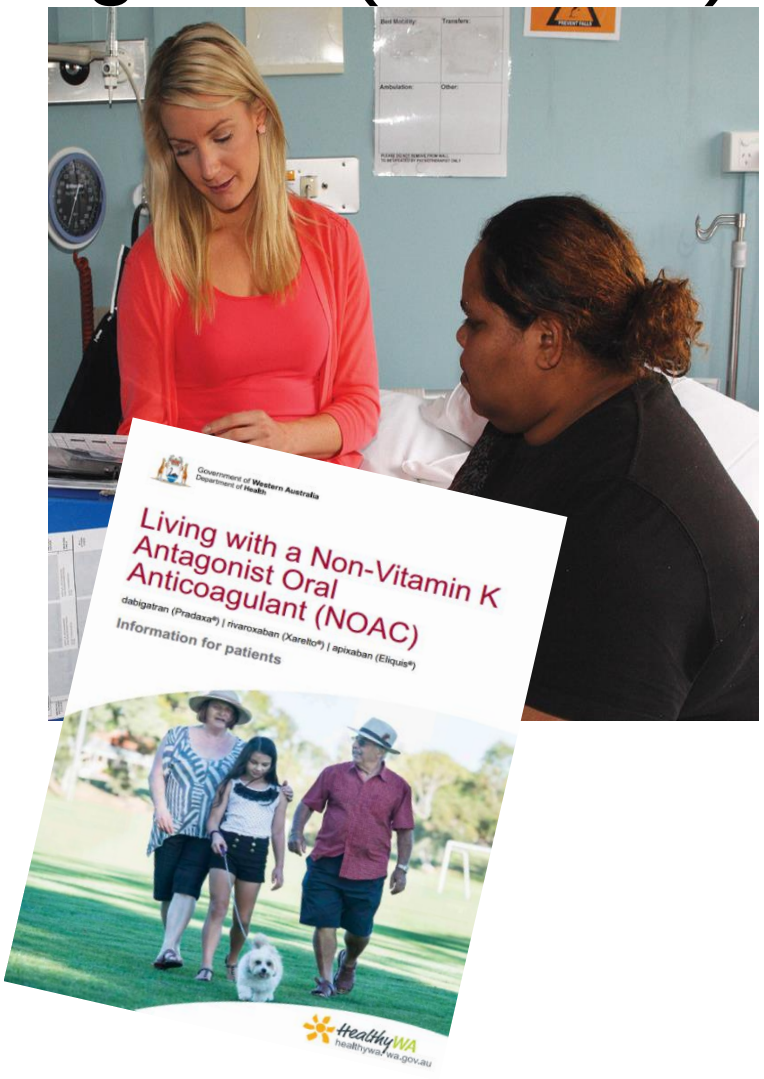
Direct Oral Anticoagulant Agents (DOACs) – Apixaban, Dabigatran, Rivaroxaban (also known as NOACs)

- Prescribe with care in elderly (> 75 years), underweight (< 50 kg), overweight (> 150 kg) and patients with renal impairment (CrCl < 50 mL/min).
- Prior to DOAC initiation: Record: FBC, Coagulation status (INR, aPTT and PT), renal and liver function. Check for medicine interactions prior to prescribing.
- If the patient is on warfarin: Discontinue warfarin and start DOAC when INR is 2 or less
- Refer to local prescribing guidelines for further information.

Apixaban (Eliquis®)	**Dabigatran** (Pradaxa®) Idarucizumab is the reversal agent for dabigatran Refer to local hospital guidelines.	**Rivaroxaban** (Xarelto®) (Use with caution if CrCL 15 - 29 mL/min)
Treatment of DVT/PE: • CrCl > 25 mL/min: 10 mg twice daily for first 7 days, then 5 mg twice daily thereafter		**Treatment and Prevention of DVT/PE:** • CrCl ≥ 15 mL/min: 15 mg twice daily for 3 weeks, then 20 mg once daily • Seek specialist advice if CrCl 15 - 29 mL/min
Non-Valvular Atrial Fibrillation (therapeutic dose): 5 mg twice daily Reduce to 2.5 mg twice daily IF at least 2 of the following risks: ☐ SCr ≥ 133 micromol/L ☐ Age ≥ 80 years, ☐ Weight ≤ 60 kg	**Non-Valvular Atrial Fibrillation (therapeutic dose):** • CrCl ≥ 50 mL/min: 150 mg twice daily • CrCl 30 - 49 mL/min or ≥ 75 years: 110 mg twice daily	**Non-Valvular Atrial Fibrillation (therapeutic dose):** • CrCl ≥ 50 mL/min: 20 mg once daily • CrCl 30 - 49 mL/min: 15 mg once daily • CrCl 15 - 29 mL/min: seek specialist advice
VTE prophylaxis: **Total Hip or Knee Replacement** • CrCl > 25 mL/min: 2.5 mg twice daily Hip: up to 38 days | Knee: up to 14 days	**VTE prophylaxis:** **Total Hip or Knee Replacement** • CrCl > 50 mL/min: 220 mg (2 x 110 mg) once daily • CrCl 30 - 50 mL/min: 150 mg (2 x 75 mg) once daily Hip: up to 35 days | Knee: up to 10 days	**VTE prophylaxis:** **Total Hip or Knee Replacement** • CrCl ≥ 15 mL/min: 10 mg once daily Hip: up to 35 days | Knee: up to 14 days
		Prevention of cardiovascular events in chronic stable CAD/PVD (in combination with aspirin): • CrCl ≥ 15 mL/min: 2.5 mg twice daily

Patient Information
Direct Oral Anticoagulant Agents (DOACs)

- Engage the patient and family in self-management of DOACs
  - Including
    - Dabigatran
    - Apixaban
    - Rivaroxaban
  - highlight the importance of identifying & reporting signs of bleeding
  - provide verbal counselling and education booklets

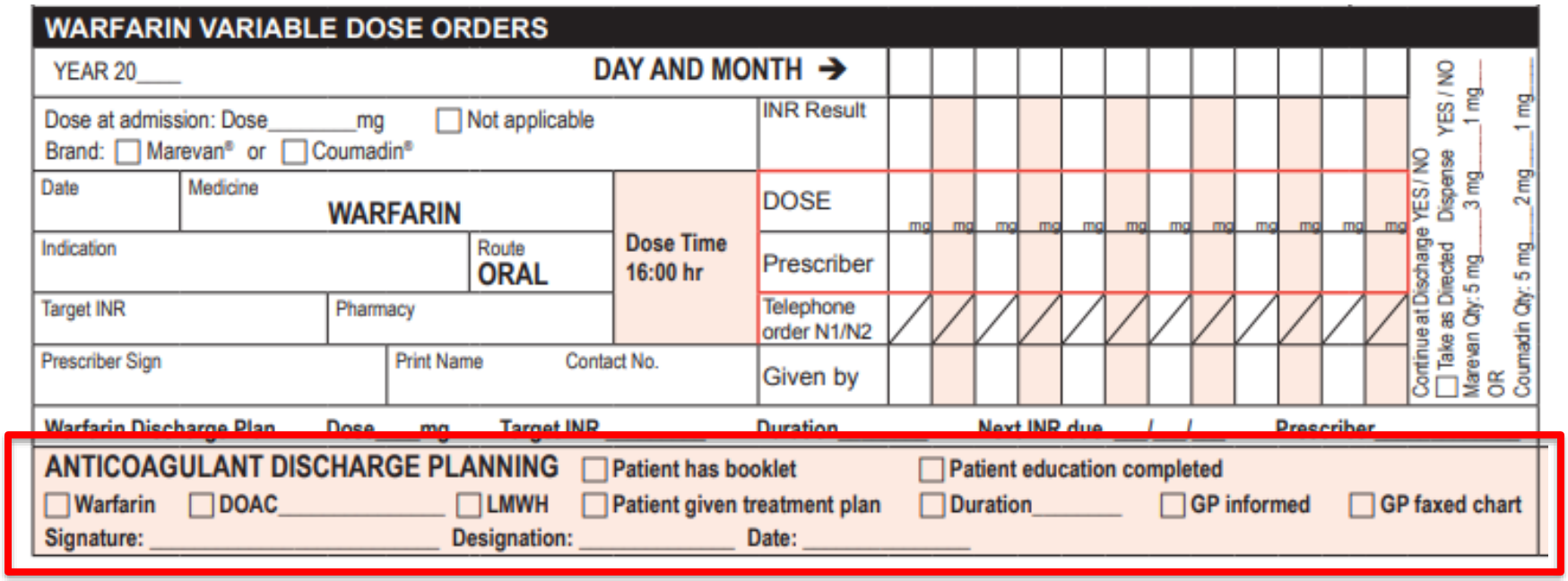


Medication safety resources DOH Website

https://www.health.wa.gov.au/~/media/Corp/Documents/Health-for/WATAG/Living-with-a-doac.pdf

Anticoagulant discharge planning

- This section should be completed for any patient that is being discharged on an anticoagulant.
- This should be used as a prompt to ensure all aspects of discharge planning are completed and handed over to the patient's GP



WARFARIN VARIABLE DOSE ORDERS

YEAR 20____ **DAY AND MONTH →**

Dose at admission: Dose_____mg ☐ Not applicable
Brand: ☐ Marevan® or ☐ Coumadin®

INR Result

Date | Medicine **WARFARIN** | **Dose Time 16:00 hr**

DOSE

Indication | Route **ORAL**

Prescriber

Target INR | Pharmacy

Telephone order N1/N2

Prescriber Sign | Print Name | Contact No.

Given by

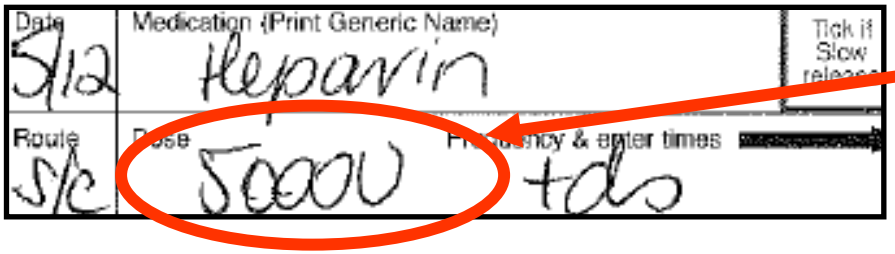
Continue at Discharge YES / NO
☐ Take as Directed Dispense YES / NO
Marevan Qty: 5 mg___3 mg___1 mg___
OR
Coumadin Qty: 5 mg___2 mg___1 mg___

Warfarin Discharge Plan Dose ___ mg Target INR _____ Duration _____ Next INR due ___/___/___ Prescriber _____

ANTICOAGULANT DISCHARGE PLANNING ☐ Patient has booklet ☐ Patient education completed
☐ Warfarin ☐ DOAC_____ ☐ LMWH ☐ Patient given treatment plan ☐ Duration_____ ☐ GP informed ☐ GP faxed chart
Signature: _____ Designation: _____ Date: _____

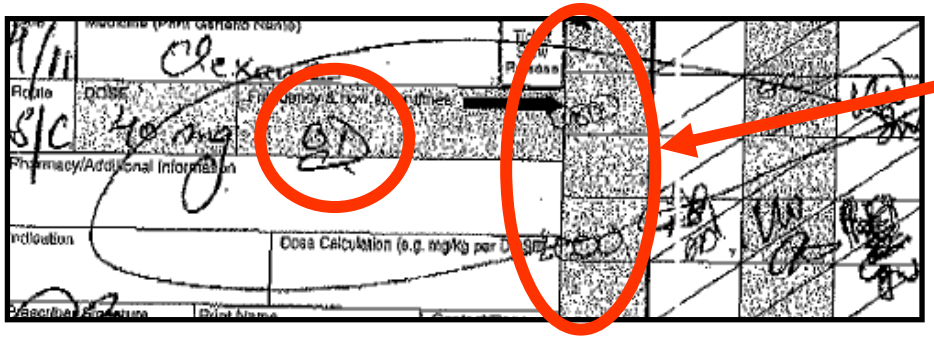
Minimising Risks with Anticoagulants

- Careful prescribing
  - Use Standardised abbreviations - write “Units”



Mistaken for

50 000 units



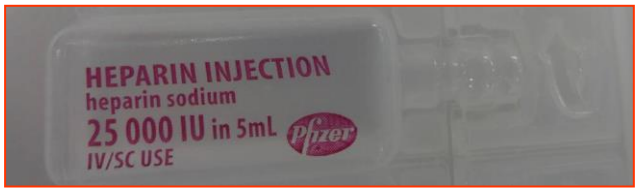
Once daily or twice daily ???

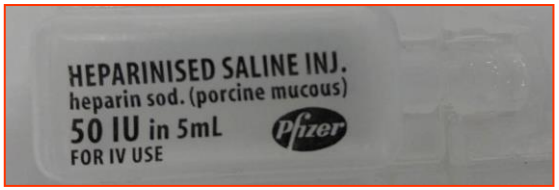
  - Brand specification for warfarin
    - Marevan® preferred unless patient previously stabilised on Coumadin ®
    - If not available on ward, ensure staff are familiar with ordering medications to ensure correct brand is supplied for patient

Minimising Risks with Anticoagulants

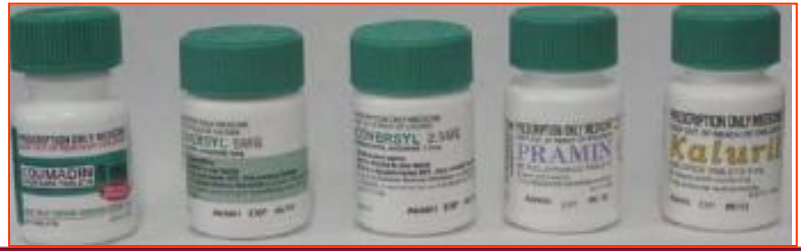
- Choosing the correct product for administration
  - Correct brand and strength of warfarin chosen

  - Multiple strengths of heparin available





  - Confusion with other medications



Adverse Effects of Anticoagulants

- The major side effect of anticoagulants is bleeding
- All symptoms must be followed up and appropriate action implemented according to the severity of the bleed
- Bleeds may be:
  - minor
  - major
  - critical

Adverse Effects of Anticoagulants

- **Minor bleeds:**
  - bleeding from gums after brushing teeth
  - bruising easily
  - nose bleeds
  - prolonged bleeding from cuts/wounds
  - excessive menstrual or vaginal bleeding

Major bleeds:

- blood in stools (melaena):
  - bright red blood-stained stools
  - black tarry stools
  - rectal bleeding
- vomiting blood (haematemesis)
  - may have a “coffee ground” appearance
- Passing blood in urine (haematuria)
  - bright red urine
  - dark brown, rusty coloured urine
- Coughing up blood (haemoptysis)
  - pink or blood-streaked sputum
- Painful, swollen, hot joints
- Patient feeling tired and looking pale (anaemia)

Intracranial Haemorrhage

- An intracerebral bleed is a clinically critical bleed

- Symptoms may include:
  - sudden, severe headache
  - change in vision, speech
  - difficulty in walking, dizziness
  - confusion
  - weakness or numbness in one arm/leg or side of face.

Warfarin Reversal (Over-treatment)

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)**	**Human Prothrombin Complex[5]**	**Comments**
Greater than therapeutic range but < 4.5	**Absent**	Reduce dose or omit next dose			Resume warfarin at reduced 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 - 2 mg (oral)[1] Or 0.5 - 1 mg IV[2]		Measure INR within 24 hours. Resume warfarin at reduced dose when INR approaches the therapeutic range.
> 10	**Absent** (Low risk)	Stop	3 - 5 mg (oral)[1] Or IV[2]		Measure INR in 12 - 24 hours. Resume warfarin at reduced dose when INR approaches the therapeutic range.
	Absent (High Risk)*	Stop	3 - 5 mg IV[2]	**Prothrombinex VF** Consider 15 - 30 Units/kg[3,4] See weight based nomogram	Measure INR in 12 - 24 hours. Resume warfarin at reduced dose when INR approaches the therapeutic range. Close monitoring over the following week.
Clinically significant bleeding where warfarin is a contributing factor. **e.g. Intracranial or massive haemorrhage**		**Stop**	**5 - 10 mg (IV)[2]**	**Prothrombinex VF 25 - 50 Units/kg[3,4] doses may be appropriate as per warfarin reversal guidelines, See weight based nomogram**	***Only add Fresh Frozen Plasma (FFP) if critical organ bleeding (150 - 300 mL) or if Human Prothrombin Complex is unavailable (FFP 15 mL/kg).*** ***If required seek consultation with a haematologist / specialist.***

Notes

[1] *undiluted paediatric IV formulation*
[2] *undiluted as slow IV bolus over at least 30 seconds*
[3] *at a rate of 3 mL/min. 500 Units of factor IX in 1 vial of Human Prothrombin Complex[5]*
[4] *available from transfusion service*
[5] *Prothrombinex VF will be replaced with Beriplex AU mid to late 2024.* ***Please seek specialist advice for Beriplex AU dosing.***

For reversal prior to a procedure – Refer to hospital guidelines or seek specialist advice. Seek advice with Vitamin K (phytomenadione) in cardiac valve replacement.

*High Bleeding Risk One or more ⇨	• Recent surgery / trauma / bleed • Advanced age	• Renal Failure • Hypertension	• Alcohol abuse • Active GI bleed	• Antiplatelet therapy • Other relevant co-morbidity

Information found on page 4 of chart

Reversal of Heparin Over-treatment

Unfractionated heparin

Reversing heparin treatment	• Seek specialist or senior colleague advice. Protamine sulfate reversal should be used for cases of major bleeding or where required prior to emergency surgery. For a high aPTT without bleeding follow nomogram (page 3). • As a guide: Estimate heparin dose received in last hour. Administer 1 mg protamine sulfate per 100 units of heparin (maximum 50 mg) as a slow IV push (over 10 minutes). Monitor aPTT after bolus then as required.

Information found on page 2 of chart

Low molecular weight heparins (e.g. enoxaparin and dalteparin)

Reversing Overtreatment	• Seek specialist advice as protamine sulfate only partially neutralises low molecular weight heparin. Only consider protamine sulfate if LMWH has been given within the last 12 hours. • Check hospital guidelines for more detailed advice on protamine sulfate use. As a guide: Give 1 mg protamine sulfate per 1 mg enoxaparin (maximum 50 mg as a single dose). • Administer initial dose (up to 50 mg) by slow IV push (over 10 minutes) and remaining dose by intravenous infusion (maximum infusion rate 5 mg/minute). Reassess the patient and the aPTT in 2-4 hours and consider a repeat dose if the patient is still bleeding or the aPTT remains prolonged.

Information found on page 3 of chart

Safe management of anticoagulants Pre and Post Invasive Procedures

- A protocol for withholding or resuming anticoagulants pre and post invasive procedures should be readily accessible to staff.
- Consideration should be made based on anticoagulant half-life, surgery type, patient's bleeding risk and thrombotic risk
- For more information refer to local guidelines

Summary

- Anticoagulants are high risk medications
- Anticoagulants
  - have complex dosing regimens
  - require monitoring for safe management
- The WA Anticoagulation Medication Chart (WA AMC) is designed to enable safe and appropriate dose selection and monitoring.