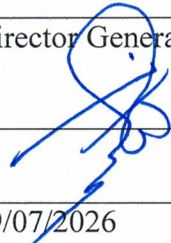


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Directorate General of Khoula Hospital

General Surgery Department

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Content

Acronyms:	4
1. Definitions:.....	5
Chapter one:	6
2. Introduction:.....	6
3. Purpose:	6
4. Scope:.....	6
Chapter two:	6
5. Structure:.....	6-11
Chapter Three:	12
6. Responsibilities.....	12
Chapter Four:	13
7. Document history and version control table:.....	13
8. References:.....	13
9. Annexes:.....	14-19

Acronyms

DGKH	Directorate General of Khoula Hospital
VTE	Venous Thromboembolism
DVT	Deep Vein Thrombosis
PAD	Peripheral Arterial Disease
PAD	Post-Admission Day
OD	Once Daily
BID	Twice Daily
TID	Three Times Daily
TBI	Traumatic Brain Injury
MRP	Most Responsible Physician
TESS	Trauma Embolic Scoring System
IPC	Intermittent Pneumatic Compression
ICH	Intracranial Hemorrhage
SCI	Spinal Cord Injury
IU	International Unit
SC	Subcutaneous
BMI	Body Mass Index
UFH	Unfractionated Heparin
LMWH	Low Molecular Weight Heparin
CrCl	Creatinine Clearance
DOAC	Direct Oral Anticoagulant
HIT	Heparin-Induced Thrombocytopenia
DTIs	Direct Thrombin Inhibitors
IVC	Inferior Vena Cava
TKR	Total Knee Replacement
THR	Total Hip Replacement

1. Definitions

- 1.1** PAD 0: The Calendar day of hospital admission.
- 1.2** PAD 1: The next full calendar day after admission.
- 1.3** PAD 2: The second calendar day from admission date.
- 1.4** High-Risk Trauma Patient: Any patient with a spinal cord injury, severe TBI, a pelvic/lower extremity fracture, multiple long bone fractures, or requiring major surgery or blood transfusion.
- 1.5** Ongoing Bleeding: The need for a blood transfusion due to haemodynamic instability, a falling haemoglobin level, or ongoing sanguineous drainage from drains or dressings within the previous 24 hours.
- 1.6** MRP: The primary responsible consultant for overseeing the patient's care.
- 1.7** Trauma Embolic Scoring System: A risk assessment tool used to estimate the likelihood of Venous Thromboembolism including Deep Vein Thrombosis (DVT) and Pulmonary Embolism (PE) in trauma patient.

Guideline for Venous Thromboembolism Prophylaxis in Trauma Patients

Chapter One

2.Introduction

Venous thromboembolism (VTE) is a leading cause of preventable morbidity and mortality in trauma patients. Despite the availability of effective prophylactic measures, variability in practice persists, leading to avoidable harm. This guideline establishes a standardized, evidence- based approach to VTE prophylaxis for all trauma patients admitted to Khoula hospital. Developed through multidisciplinary collaboration, this guideline translates international guidelines into a practical, locally adapted pathway.

3.Purpose

The purpose of this guideline is to standardize the approach to Deep Vein Thrombosis (DVT) and Venous Thromboembolism (VTE) prophylaxis for all trauma patients admitted to Khoula Hospital, with the aim of minimizing the risk of VTE while ensuring patient safety and reducing the risk of bleeding complications.

4. Scope

This guideline applies to all multidisciplinary teams involved in the care of adult and paediatric trauma patients, including Trauma Surgery, Orthopaedics, Neurosurgery, Plastic Surgery, the Intensive Care Unit, Paediatrics, Nursing and Obstetrics and Gynaecology.

Chapter Two

5.Structure

It is the guideline of DGKH to standardize the approach to Deep Vein Thrombosis (DVT) and Venous Thromboembolism (VTE) prophylaxis for all trauma patients.

5.1 General Principles for All Trauma Patients:

a.Initiate mechanical prophylaxis upon admission unless contraindicated.

- First Line: Use Intermittent pneumatic compression (IPC) devices.
- Nursing Compliance: Document IPC wear time. The Target is more than 20 hours per day. Remove the device only for hygiene care and ambulation.

b.Early Mobilization: Encourage early mobilization as soon as it is medically and surgically safe.

c.Reassessment: Reassess the patient's risk of VTE and bleeding at least every 24 hours.

d.Important consideration:

- If bilateral application is not possible because of an injury, apply the IPC device to the uninjured limb.

- Caution must be taken for patients with peripheral arterial disease (PAD), long hours might lead to irreversible ischaemia of lower limbs.

5.2 Pharmacological Prophylaxis: Timing & Agent Selection

The goal is initiation within 24 hours of admission for most patients.

➤ Important consideration:

- Anti-Factor Xa level monitoring is not available at Khoula Hospital currently and is therefore not currently recommended. Instead, clinical monitoring for bleeding or thrombosis and renal function surveillance will guide dosing. If there is concern for under- or over-anticoagulation (e.g., extremes of weight, renal impairment), consult Thromboembolism & clinical haematology for empirical dose adjustment.
- Twice-daily dosing should be administered at consistent 12-hour intervals (e.g., 08:00 and 20:00).

5.2.1 First-Line Agent

Recommended for the majority of adult trauma patients without contraindications.

a. Enoxaparin Regimens:

- Standard Adult Dose: 3000 IU SC BID (suggested start time at e.g., 22:00 hours).
- Alternative Options: 4000 IU SC OD (If the clinical team is not comfortable with BID).
Note that BID is strongly preferred for high-risk patients.
- High-Risk/Obese Adults (BMI >40): 4000 IU SC BID. Consider escalating to 5000-6000 IU SC BID based on weight, clinical judgement and Thromboembolism/Clinical Haematology consultation.
- Renal Impairment:
 - CrCl 30-60 mL/min: Reduce enoxaparin dose to 3000 IU SC OD.
 - CrCl < 30 mL/min: Use Unfractionated Heparin (UFH) 5000 units SC BID.
- Pregnant Patient:
 - Enoxaparin on 4000 SC OD.

5.2.2 Second-Line & Alternative Agents:

a. Unfractionated Heparin (UFH):

- Dose: 5,000 units SC TID (preferred) or BID.
- Monitoring: Check platelet counts regularly to monitor for Heparin-Induced Thrombocytopenia (HIT).
- Primary Indications:
 - Severe renal impairment (CrCl <30 mL/ min).

- Situations where rapid reversal may be needed due to short half-life.

b. Fondaparinux (Synthetic pentasaccharide):

- i. Dose: 2.5 mg SC OD.
- ii. Primary Indication: Prophylaxis in patients with a history of HIT.
- iii. Key Considerations:

- Contraindicated if CrCl < 30 mL/min.
- Long half-life (~17-21 hours) with no specific reversal agent.

c. Rivaroxaban or Apixaban (DOAC):

- i. Prophylactic Dose: Rivaroxaban 10 mg orally OD; Apixaban 2.5 mg orally BID
- ii. Primary Role: Extended Outpatient Prophylaxis upon discharge.
- iii. Indication: Selected high-risk trauma patients (e.g., major pelvic/orthopedic trauma) transitioning from inpatient enoxaparin.
- iv. Use with caution In: (Consult thromboembolism & clinical haematology)
 - Unreliable GI absorption (e.g., ileus, NG suction, bowel injury).
 - In-patient use (consult regarding timing).
 - Active intracranial, spinal, or intraocular bleeding.
 - Avoid use if CrCl < 30 mL/min.
 - Concomitant use of strong interacting drugs.

5.2.3 Agents for Specialized / Acute Management:

a. Direct Thrombin Inhibitors (DTIs) - For Active HIT:

These are therapeutic agents, not prophylactic agents, and require Thromboembolism & Clinical Haematology Consultation. These include Argatroban and Bivalirudin.

b. Warfarin:

- i. Role: Not indicated for prophylaxis. It is used for long-term therapeutic anticoagulation after confirmed DVT/PE.
- ii. Initiation: Warfarin should be bridged with a therapeutic dose of LMWH/UFH until the INR reaches the therapeutic range (2.0-3.0) for at least 24 hours.

c. Aspirin:

- i. Role in Trauma VTE Prophylaxis: Aspirin is not recommended for inpatient VTE prophylaxis.
- ii. Special Considerations: If the patient refuses other anticoagulants, aspirin 81mg once daily may be considered after a careful risk-benefit assessment, with appropriate precautions for patient with renal impairments.

5.3 Timing of First Dose:

- a. Default: Administer the first dose at the next scheduled administration time (e.g., 22:00 hours) once the decision has been made that the bleeding is controlled.
- b. For most patients, this will be on PAD 0 or PAD 1. Delay initiation for specific injuries as outlined in appendix (2)

5.4 Management of Missed or Delayed Doses: Missed doses of chemical

thromboprophylaxis significantly increase the risk of VTE in trauma patients. The following recommendations apply:

5.4.1 "Do Not Hold" Policy: Prophylaxis should not be withheld for scheduled non-neurological/ non-spinal surgeries (e.g., orthopaedic fixation or soft tissue repair) unless explicitly ordered by the attending surgeon.

5.4.2 Catch-Up Window: If a scheduled dose is missed (e.g., the patient is off the ward for imaging):

- a. If the delay is less than 12 hours: Administer the missed dose immediately upon the patient's return.
- b. If the delay exceeds 12 hours: Skip the missed dose and administer the next scheduled dose at the regular time. Do not double the dose.
- c. Documentation: All missed doses must be documented as a clinical incident, including the specific reason (e.g., Refusal, Procedure) to facilitate auditing and risk reassessment.

5.5 Bleeding Emergency & Reversal Major Bleeding on Prophylaxis:

5.5.1 Immediately hold anticoagulant.

5.5.2 Provide supportive care, including IV fluids and blood transfusions as clinically indicated.

5.5.3 In general, prophylactic doses do not require reversal (Consult thromboembolism). However, if clinical assessment determines that reversal is necessary, use the following guidance.

a. For Enoxaparin:

- If last dose was administered < 8 hours ago, administer protamine sulphate 1 mg per 100 IU of enoxaparin (maximum dose: 50 mg).
- If last dose was administered 8-12 hours ago, administer 50 IU per 100 IU.
- If > 12 hours, protamine is usually not required
- Consult thromboembolism, clinical hematology and ICU.

5.5.4 For UFH: Prophylactic doses do not require reversal (Consult thromboembolism) If clinically needed, reverse with Protamine Sulphate (1 mg per 100 units of UFH, if last dose within 2-3 hours).

5.5.5 Consult thromboembolism, clinical haematology and ICU.

5.6 Paediatric Considerations (Age < 16 years):

a. VTE is uncommon in children but the risk increases significantly in adolescents and in the presence of the following risk factors:

- Presence of a central venous line.
- Adolescent obesity.
- Severe head injury or spinal cord injury.
- Major lower extremity orthopedic trauma.

b. Recommendations:

- Mechanical Prophylaxis: Strongly recommended for all immobilized children.
- Pharmacological Prophylaxis: Consult Pediatric Hematology team for all cases.
- Dosing: Enoxaparin 0.75 mg/kg/dose SC twice daily for infants < 2 months of age, or 0.5 mg/kg/dose SC twice daily for children >2 months of age. Dosing MUST be weight-based.

c. Monitoring considerations:

- Routine anti-factor Xa monitoring is not required for standard pediatric prophylaxis in otherwise healthy children >2 months of age and should be considered in the following high-risk group:
 - Neonates (< 2 months of age).
 - Critically ill patients / ICU patients.
 - Patients with renal impairment (Crcl < 30 mL/min).
 - Patient with hepatic impairment.
- As anti-factor Xa monitoring is currently unavailable at Khoula Hospital, a mandatory consultation with Paediatric Haematology is required for all high risk paediatric patients to guide empirical dose adjustment and close clinical monitoring for bleeding.

5.7 Management of Diagnosed DVT/PE & IVC Filter Placement:

a. Consider duplex Doppler ultrasound screening of the lower extremities in high-risk patients (e.g., SCI, pelvic fracture, prolonged immobility >1 week) who have had interruptions in chemoprophylaxis, even in the absence of clinical signs.

b. If DVT/PE is identified: Start therapeutic anticoagulation if no absolute contraindications exist. Consult relevant services (Thromboembolism & Clinical Hematology).

c. If therapeutic anticoagulation is contraindicated: Consult vascular surgery to consider a retrievable IVC filter placement. A mandatory plan for filter retrieval must be documented at the time of placement.

d. Ideal Retrieval Window:

- Retrievable IVC filters should be removed as soon as the contraindication to anticoagulation resolves, typically within 30-60 days of placement.
- If anticoagulation is still contraindicated at 60 days, reassess every 30 days.
- Filters left > 6 months have significantly higher retrieval failure rates and complications rate.
- The vascular surgery, interventional radiology, thromboembolism and clinical hematology team is responsible for scheduling retrieval. A filter registry should be maintained within patient documents/Kardex.

5.8 Extended Out-of-Hospital Prophylaxis:

Consider extended prophylaxis (Up to four weeks after date of admission) at discharge for high-risk patients:

- a. For those who undergoing major orthopaedic surgery, pharmacologic prophylaxis may be extended up to 35 days from the date of surgery.
- b. Enoxaparin doses above 4000 IU SC twice daily should be avoided.
- c. Aspirin (81-325 mg daily) may be considered only after 5 days of anticoagulants. It should only be used if other pharmacological agents (e.g., enoxaparin, rivaroxaban) are declined by patient, contraindicated, or not feasible. Evidence suggests aspirin is less effective than LMWH or DOACs for VTE prevention after major trauma, but it is superior to no prophylaxis. Patients should be counselled accordingly.
- d. DOACs (Direct Oral Anticoagulants) may also be considered for post discharge pharmacologic prophylaxis after an isolated orthopaedic injury (Off label use outside THR and TKR).
- e. The decision requires MRP approval based on individual bleeding risk.

Chapter Three

6.Responsibilities

6.1 Directors /HoD Shall:

- 6.1.1 Be aware of this guideline.
- 6.1.2 Ensure that all Most Responsible Physicians (MRP) adhere to this guideline.

6.2 Physician (MRP) Shall:

- 6.2.1 Be responsible for ordering, initiating, continuing, and holding VTE prophylaxis.

6.3 Pharmacist Shall:

- 6.3.1 Adhere to this guideline.
- 6.3.2 Review dosing and suggest adjustments for renal function/weight.

6.4 Ward In Charge Nurses Shall:

- 6.4.1 Ensure that all staff nurses adhere to this guideline.

6.5 Nurses Shall:

- 6.5.1 Be aware of this guideline.
- 6.5.2 Administer medications, apply/manage mechanical devices, and document compliance.

Chapter Four

7. Document History and Version Control Table

Version	Description	Name of Authors	Review Date
1	Initial release	Dr. Mohamed Abdel Rahman	2029
2	Second version		

8. References

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9. Annexes

9.1 Appendix (1): Trauma Embolic Scoring System (TESS)

Table 1 Components of the Trauma Embolic Scoring System (TESS) and their associated scores (adapted from Rogers *et al*¹⁴)

Predictor	TESS score
Age (years)	
18–29	0
30–64	1
≥65	2
Injury Severity Score	
1–9	0
10–16	3
17–25	3
>25	5
Pre-existing obesity	
No pre-existing obesity	0
Pre-existing obesity	1
Ventilation days	
No ventilation days	0
Ventilator days	4
Lower extremity fracture	
No lower extremity fracture	0
Lower extremity fracture	2

Important considerations:

- **0–2 points:** Not considered at risk for VTE; no prophylaxis needed.
- **3–6 points:** Low risk; mechanical prophylaxis may be recommended.
- **7–14 points:** Moderate to high risk; pharmacologic prophylaxis is typically recommended.

9.2 Appendix (2): Special Considerations & Management of Contraindications

Clinical Scenario	Recommended Action
Traumatic Brain Injury (TBI) with Intracranial Haemorrhage (ICH)	• Classify using the mBiG Criteria (Table 2) • A neurosurgery consultation is mandatory • Consider delay for 48-72 hours
mBiG 1	• Initiate Chemoprophylaxis on PAD 1.
mBiG 2 or 3	• Repeat a head CT head at 6 hours to confirm no radiological progression • If stable, initiate chemoprophylaxis on the evening of PAD 2 if stable
Post-Neurosurgical Intervention	• Coordinate care with Neurosurgery Team • Chemoprophylaxis is typically initiated 48-72 hours after craniotomy, craniectomy or ICP monitor placement
Spinal Cord Injury (SCI) with Motor Deficit	• Initiate pharmacologic prophylaxis once primary haemostasis is achieved (typically within 24-48 hours), provided there is no ongoing bleeding • Consult the spinal surgery team • Consider enoxaparin 3000 IU SC BID for this high-risk group
Spinal Epidural Haematoma	• For patients with a normal neurologic examination, initiate Chemoprophylaxis on PAD 2 with spinal cord monitoring q4h x 24h • Spine service must guide timing in patients with abnormal neurological examination

High-Grade Solid Organ Injury (Grade IV/V Liver/Spleen/Kidney)	In the absence of ongoing transfusion, initiate Chemoprophylaxis on PAD 1
Ongoing Active Bleeding	• Withhold Chemoprophylaxis • Reassess q24h. • Initiate the first dose at 22:00 hour on the first evening after bleeding has been controlled for 24 hours.
Suspected HIT	• Stop all heparin products (UFH, LMWH). • Consult the Thromboembolism & clinical haematology immediately for alternative anticoagulation.
Epidural / Spinal Anaesthesia	• Allow at least 12 hours after the last prophylactic dose before epidural / spinal catheter insertion or removal • Restart Chemoprophylaxis 2-4 hours after catheter removal • Timing should be coordinated with the anaesthesia team
Pregnancy	• Consult the Obstetrics team

9.3 Appendix (3): Modified Brain Injury Guidelines (mBiG) for VTE Prophylaxis

(All criteria within a column must be met for classification)

	mBIG 1	mBIG 2	mBIG 3
Initial GCS	13-15	13-15	any
Abnormal neurological exam	no	no	yes
intoxication ¹	no	yes	yes
anticoagulation/ antiplatelet (excluding ASA) ²	no	no	yes
Skull fx	no	non-displaced	displaced
SDH	≤4mm	4-7.9mm	≥8mm
EDH	no	no	yes
IPH	≤4mm	4-7.9mm	≥8mm or multiple
SAH	≤3 sulci and <1mm	Single hemisphere or 1-3mm	Bi-hemispheric or >3mm
IVH	no	no	yes

Important consideration:

- A patient with more than one mBiG1 lesion is classified as mBiG3.
- MDCalc link: <https://www.mdcalc.com/calc/10432/modified-brain-injury-guideline-mbig>

9.4 Appendix (4): IVC Filter Indications

Indications

- ❖ **Proven VTE with contraindication for anticoagulation**
- ❖ **Proven VTE with complications of anticoagulation treatment**
- ❖ **Recurrent VTE despite anticoagulation treatment (failure of anticoagulation).**

Extended/Controversial Use

- ❖ **Recurrent PE complicated by pulmonary hypertension**
- ❖ **Patients with DVT and limited cardiopulmonary**
- ❖ **Reserve or chronic obstructive pulmonary disease**
- ❖ **Patients with large, free-floating iliofemoral thrombus**
- ❖ **Following thrombectomy, embolectomy, or thrombolysis of DVT**
- ❖ **High-risk trauma patients (head and spinal cord injury, pelvic or lower extremity fractures) with a contraindication for anticoagulation**
- ❖ **High-risk surgical patients with a contraindication for anticoagulation**
- ❖ **Patients with DVT who have cancer, burns, or are pregnant.**

9.5 Appendix (5): Guideline Diagram

