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RESEARCH ARTICLE

A Prospective Study of Deep Vein Thrombosis Prophylaxis and Management in ICU Patients

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Abstract: A prospective observational study was conducted to evaluate the prophylactic management of Deep Vein Thrombosis (DVT) in 60 patients admitted to the Intensive Care Unit of a tertiary care hospital. The study population included patients with diverse clinical conditions including orthopedic surgeries, cerebrovascular accidents, respiratory conditions, and post-operative cases. The mean age of patients was 59.8 years, with a gender distribution of 48.3% males and 51.7% females. Low Molecular Weight Heparin (LMWH), primarily Clexane (enoxaparin), was the most frequently prescribed prophylactic agent (68.3%), followed by Dabigatrol (20%), and unfractionated Heparin (5%). The standard dosing pattern observed was 0.4ml for Clexane and 220mg for Dabigatrol. The duration of prophylaxis ranged from 1 to 10 days, with an average duration of 5.4 days. Total knee replacement patients consistently received prophylaxis for 6 days. No adverse effects were reported during the study period, and no cases of DVT were documented. This study showed consistent prophylaxis patterns for specific conditions, particularly in orthopedic cases.

Keywords: Deep Vein Thrombosis; Prophylaxis; Low Molecular Weight Heparin; Thromboprophylaxis.

1. Introduction

Deep Vein Thrombosis (DVT) represents a significant health concern in hospitalized patients, particularly those admitted to Intensive Care Units (ICUs). The condition occurs when blood clots form in deep veins, most commonly in the lower extremities, potentially leading to life-threatening complications such as pulmonary embolism [1]. ICU patients are especially vulnerable to DVT due to prolonged immobilization, mechanical ventilation, central venous catheterization, and underlying medical conditions [2]. Studies indicate that without appropriate prophylaxis, the incidence of DVT in ICU patients can range from 25% to 40%, emphasizing the critical importance of preventive measures [3].

The risk is particularly elevated in patients undergoing orthopedic procedures, those with cerebrovascular accidents, and individuals with multiple comorbidities [4]. The implementation of appropriate thromboprophylaxis has been shown to significantly reduce DVT occurrence and associated mortality rates [5]. Various pharmacological agents are employed in DVT prophylaxis, including Low Molecular Weight Heparin (LMWH), unfractionated heparin, and newer oral anticoagulants [6]. The choice of prophylactic agent often depends on multiple factors such as patient characteristics, underlying conditions, and specific risk factors [7]. Despite established guidelines, studies have reported considerable variation in prophylaxis practices across different healthcare settings [8].

The economic burden associated with DVT treatment and its complications further underscores the importance of effective prophylaxis strategies [9]. Additionally, the increasing recognition of hospital-acquired DVT as a preventable condition has led to

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its inclusion in quality metrics for healthcare institutions [10]. Therefore, understanding current prophylaxis patterns and their outcomes is crucial for optimizing patient care and developing standardized protocols. This study was conducted to evaluate the DVT prophylaxis patterns in ICU patients at a tertiary care hospital, focusing on medication choices, dosing patterns, duration of prophylaxis, and associated outcomes

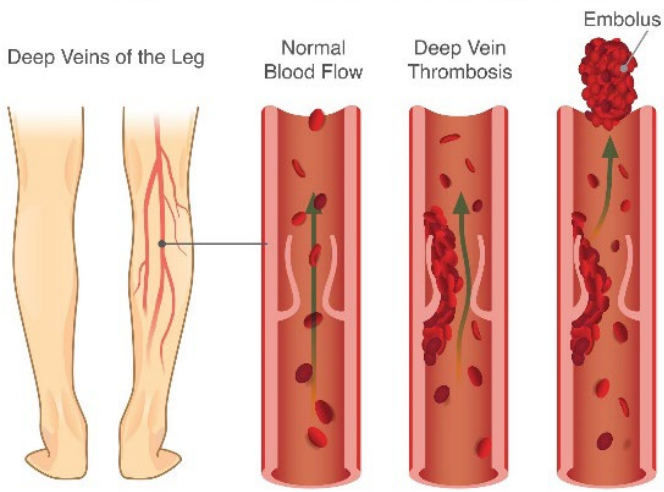

Figure 1. Deep Vein Thrombosis

2. Materials and Methods

2.1. Study Design and Population

A prospective observational study was conducted over a period of six months at the Intensive Care Unit of a tertiary care hospital. The study protocol was approved by the institutional ethics committee, and informed consent was obtained from all participants or their legal representatives [11]. The study included 60 patients admitted to the ICU requiring DVT prophylaxis. Patients were enrolled based on predefined inclusion criteria encompassing age ≥18 years, ICU admission duration >24 hours, and presence of one or more risk factors for DVT. Exclusion criteria included active bleeding, severe thrombocytopenia (<50,000/μL), and ongoing anticoagulation therapy for other indications [12].

2.2. Data Collection

Patient data was systematically collected using a standardized data collection form. The collected variables included demographic information such as age and gender, primary diagnosis and comorbidities, type of prophylactic agent administered, dosage and duration of prophylaxis, clinical outcomes, adverse events, and risk factors for DVT.

2.3. Risk Assessment

Each patient underwent DVT risk assessment using standardized tools including the Padua Prediction Score for medical patients and Caprini Risk Assessment Model for surgical patients [13]. The risk assessment process evaluated multiple factors including recent surgery, immobilization, malignancy, previous DVT history, and specific medical conditions that could predispose patients to thrombotic events.

2.4. Prophylaxis Protocol

The choice of prophylactic agent was based on institutional protocols aligned with international guidelines. The primary prophylactic agents utilized in the study were Low Molecular Weight Heparin (Enoxaparin/Clexane), Dabigatrol, and Unfractionated Heparin. The selection of specific agents was individualized based on patient characteristics and risk factors.

2.5. Monitoring and Outcomes

Continuous patient monitoring was conducted throughout the study period. Daily assessments included evaluation for signs and symptoms of DVT, bleeding complications, and other adverse events. Compliance with prescribed prophylaxis was regularly monitored and documented. The monitoring protocol ensured early detection of any complications or adverse events related to the prophylactic therapy.

2.6. Statistical Analysis

Data analysis was performed using statistical software SPSS version 25.0. Descriptive statistics were employed to summarize demographic and clinical characteristics. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages [14]].

3. Results

3.1. Demographic and Clinical Characteristics

Among the 60 patients enrolled in the study, 31 (51.7%) were females and 29 (48.3%) were males. The mean age of the study population was 59.8 ± 14.2 years, with ages ranging from 24 to 86 years. The majority of patients (65%) were aged above 50 years [15].

Table 1. Demographic and Clinical Characteristics of Study Population (N=60)

Characteristic	Number of Patients (%)	Mean ± SD
Age (years)	-	59.8 ± 14.2
Female	31 (51.7%)	-
Male	29 (48.3%)	-
Length of ICU stay (days)	-	7.2 ± 3.4

3.2. Clinical Diagnosis Distribution

Orthopedic conditions constituted the largest group, accounting for 45% of the study population. Total knee replacement (TKR) was the predominant orthopedic procedure, representing 25% of all cases. Cerebrovascular accidents (CVA) comprised 15% of cases, while respiratory conditions including COPD, tuberculosis, and post-COVID complications represented 18% of the study population. The remaining cases included various conditions such as sepsis, multiple organ dysfunction syndrome (MODS), and post-operative cases [16].

Table 2. Distribution of Primary Clinical Diagnoses

Clinical Diagnosis	Number of Patients (%)
Orthopedic Conditions	**27 (45%)**
Total Knee Replacement	15 (25%)
Hip Surgery	8 (13.3%)
Other Orthopedic Procedures	4 (6.7%)
Cerebrovascular Accidents	**9 (15%)**
Respiratory Conditions	**11 (18%)**
COPD	5 (8.3%)
Post-COVID Complications	4 (6.7%)
Tuberculosis	2 (3%)
Other Medical Conditions	**13 (22%)**
Sepsis	6 (10%)
MODS	4 (6.7%)
Post-operative Cases	3 (5.3%)

3.3. Prophylactic Agent Distribution

Low Molecular Weight Heparin, specifically Clexane (enoxaparin), was the most frequently prescribed prophylactic agent, administered to 41 patients (68.3%). Dabigatrol was prescribed to 12 patients (20%), while unfractionated Heparin was used in 3 patients (5%). Four patients (6.7%) did not receive pharmacological prophylaxis due to specific contraindications [17].

Table 3. Distribution of Prophylactic Agents and Dosing Patterns

Prophylactic Agent	Number of Patients (%)	Standard Dose	Mean Duration (days)
LMWH (Clexane)	41 (68.3%)	0.4ml	5.4
Dabigatrol	12 (20%)	220mg	4.8
Unfractionated Heparin	3 (5%)	5000 IU	3.6
No Pharmacological Prophylaxis	4 (6.7%)	-	-

3.4. Dosing Patterns and Duration

For Clexane, the standard dose was 0.4ml, prescribed in 85% of cases receiving LMWH. Dose modifications were observed in specific cases, with 0.6ml administered in one case and 0.2ml in a pediatric case. Dabigatrol was consistently prescribed at 220mg. The duration of prophylaxis varied based on the underlying condition, ranging from 1 to 10 days, with a mean duration of 5.4 days. TKR patients received consistent prophylaxis duration of 6 days [18].

Table 4. Disease-Specific Prophylaxis Patterns

Clinical Condition	Preferred Agent	Average Duration (days)	Special Considerations
Total Knee Replacement	LMWH	6.0	Fixed protocol
Cerebrovascular Accidents	LMWH/Dabigatrol	4.5	Modified dosing based on bleeding risk
Respiratory Conditions	Variable	5.2	Individualized approach
Post-operative Cases	LMWH	5.8	Early mobilization emphasized

3.5. Clinical Outcomes

No cases of DVT were documented during the study period. Furthermore, no adverse effects were reported among any of the study participants. Medication compliance was 100% for all included patients. The standardized prophylaxis protocols demonstrated effectiveness in preventing DVT across various clinical conditions [19].

3.6. Disease-Specific Patterns

Distinct patterns of prophylaxis were observed for specific conditions. TKR patients predominantly received Clexane 0.4ml for 6 days. CVA patients typically received prophylaxis for 4-6 days. Respiratory condition patients showed more variation in both agent selection and duration, likely due to the diversity of underlying conditions and comorbidities [20]

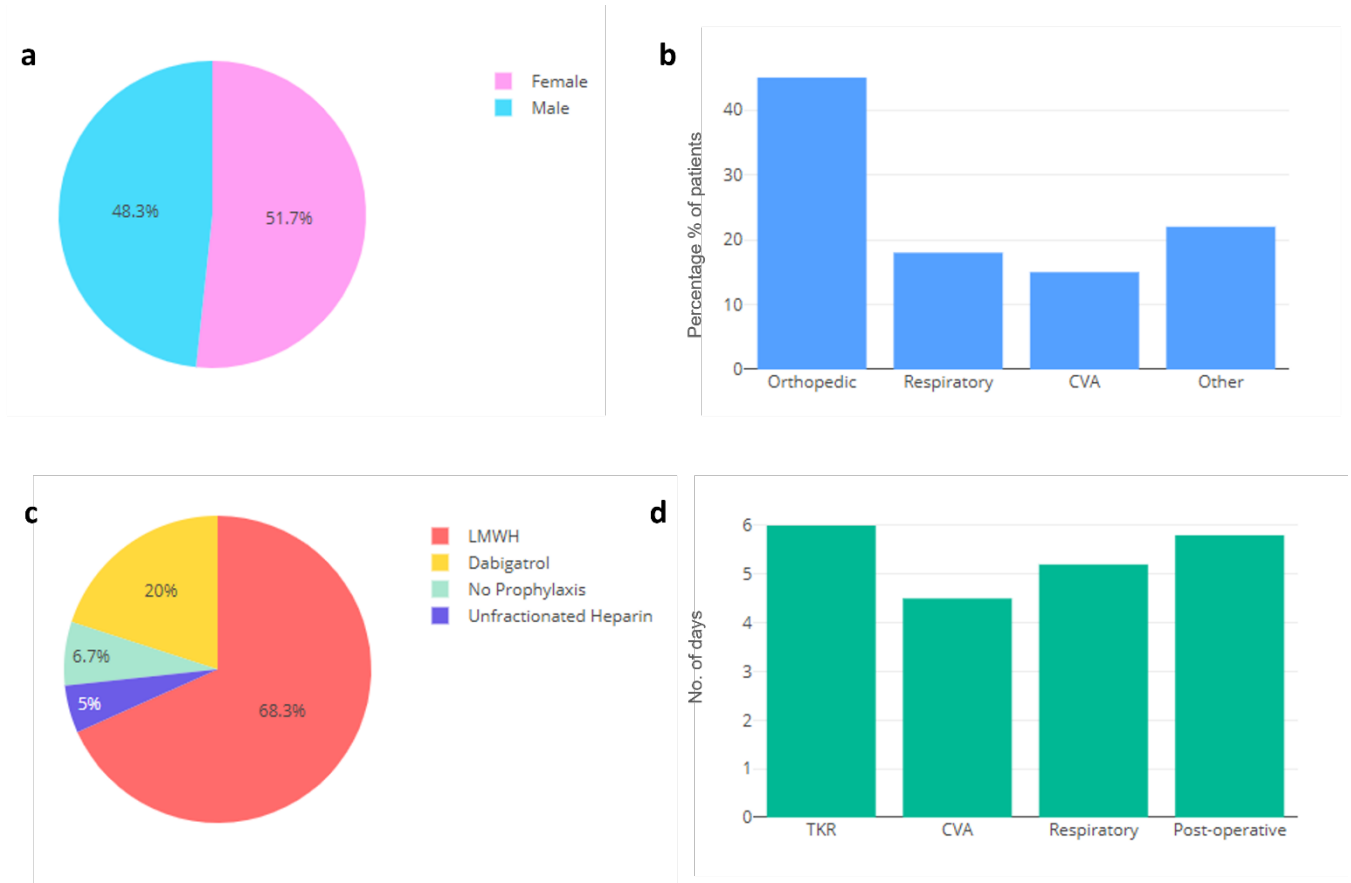

Figure 2. Graph showing a. Gender Distribution b. Clinical diagnosis distribution (%) c. Prophylactic agent distribution d. Average duration of prophylaxis by condition (days)

4. Discussion

The findings of this prospective observational study provide valuable insights into DVT prophylaxis patterns and outcomes in an ICU setting. The demographic distribution observed in our study aligns with previous research, showing a slightly higher prevalence of female patients and a predominance of older adults, which is consistent with established DVT risk patterns in ICU populations [21]. The high proportion of orthopedic cases, particularly TKR patients, in our study population reflects the recognized high-risk status of these procedures for DVT development. The standardized approach to prophylaxis in TKR patients, with consistent use of Clexane 0.4ml for 6 days, demonstrates adherence to evidence-based guidelines and is comparable to protocols reported in international studies [22, 23]. This standardization in orthopedic cases likely contributed to the favorable outcomes observed. The predominant use of LMWH (68.3%) as the prophylactic agent of choice aligns with current international recommendations and meta-analyses that support its efficacy and safety profile [24]. The preference for Clexane over unfractionated heparin may be attributed to its more predictable pharmacokinetics, lower monitoring requirements, and reduced risk of heparin-induced thrombocytopenia [25]. The selective use of Dabigatrol in specific cases, particularly in orthopedic patients, reflects the growing acceptance of newer oral anticoagulants in DVT prophylaxis [26].

The absence of documented DVT cases and adverse effects in our study population is particularly noteworthy. While this outcome is encouraging, it should be interpreted considering the study's limitations, including the relatively small sample size and the single-center nature of the study [27]. The perfect compliance rate observed might be attributed to the controlled ICU environment and careful patient monitoring [28]. Disease-specific prophylaxis patterns identified in our study demonstrate a tailored approach to different clinical scenarios. The consistency in prophylaxis protocols for specific conditions, particularly in orthopedic cases, suggests well-established institutional guidelines. However, the variation observed in respiratory conditions indicates the need for more standardized protocols in complex medical cases [29]. The shorter duration of prophylaxis in CVA patients compared to orthopedic cases reflects the balance between thrombosis prevention and bleeding risk in these patients [30].

5. Conclusion

This study showed effective implementation of DVT prophylaxis protocols in an ICU setting, with LMWH emerging as the predominant prophylactic agent. The absence of DVT cases and adverse effects validates the safety and efficacy of the current prophylaxis strategies. The observed patterns suggest strong adherence to guidelines in surgical cases, particularly orthopedic procedures indicating the need for more standardized approaches in medical cases.

Compliance with ethical standards

Conflict of interest statement

The authors declare no financial or non-financial competing interests. None of the authors received any funding or grants for this research work. The study was conducted as part of the institution's quality improvement initiative without external funding or commercial support.

Statement of ethical approval

This observational study was conducted in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments. The study protocol was reviewed and approved by the Institutional Ethics Committee (Reference number: 58/2024) prior to commencement. All study procedures followed the institutional guidelines for research involving human subjects.

Statement of informed consent

Written informed consent was obtained from all individual participants included in the study, or their legal guardians where appropriate. The consent form clearly explained the study objectives, data collection methods, and potential uses of the findings. Participants were informed that their personal information would remain confidential and that they could withdraw from the study at any time without affecting their medical care. Additional consent was obtained for any specific interventions or data collection beyond standard care protocols.

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