Effect of Implementing a Nursing Protocol on Controlling Venous Thromboembolism among Post-Operative Patients with Femur Fracture Surgeries.

Eman Khalil Mohamed, Assistant lecturer
Medical-Surgical Nursing, Faculty of Nursing, Alexandria University
Mervat Adham Ghaleb, professor
Medical-Surgical Nursing, Faculty of Nursing, Alexandria University
Mohamed Hossam Ibrahim El-shafie, professor
Orthopedic Surgery and Traumatology, *Faculty of Medicine, Alexandria University*
Naglaa Abdallah Abd-Elhafeez, Assistant professor
Medical-Surgical Nursing, Faculty of Nursing, Alexandria University

Abstract

*Background: Rotational and angling stresses exerted by top-down forces on the femoral head and neck are the primary causes of femur fractures, a common hip trauma **Objective:** Determine the effect of implementing a nursing protocol, on controlling Venous thromboembolism among post-operative patients with femur fracture surgeries. **Settings:** The inpatient and outpatient clinics of El-Hadra Orthopaedic and Traumatology Hospital in Alexandria were the sites of the current study. **Subjects:** 60 adult male and female patients; a convenience sample. They were organised into two equal sequential groups: the control and studied group. **Tools:** Seven tools were used for data collection of this study. **Results:** Following the implementation of the nursing protocol, 30% of the control subjects developed deep vein thrombosis in the right lower limb and 20% in the left lower limb. Conversely, the nursing protocol resulted in absence of DVT in the majority of the studied group (96.7%).The control and studied group patients exhibited a high statistically significant difference following implementation of the nursing protocol ($\chi2=16.86$ $p=<0.001***$). **Conclusion:** The nursing protocol for patients undergoing femur fracture surgeries showed a positive finding in relation to controlling of VTE. The proposed nursing protocol implementation illustrated positive health outcomes of the studied patients as evidenced by improvement in knowledge level regarding VTE and anticoagulant- therapy post implementation of the nursing protocol. The studied patients had improvement in practice level regarding total ankle range of motion assessment score, adherence to anticoagulant therapy, safe use of mechanical prophylaxis & walker compared to the controls post implementation of the nursing protocol. **Recommendation:** Replication of this study using large probability sample.*

Introduction

Rotational and angling stresses that result from top-down forces acting on the femoral head and neck are the primary cause of femur fractures, a widely occurring hip trauma. This form of trauma is frequently the consequence of violence that is transmitted or distorted high-impact activities, such as motor vehicle accidents, falls from height or sports- related injuries. In recent years, the incidence of femur fractures has considerably increased due to ageing population, trauma, immobilisation, and comorbidity (Quinzi et al., 2021).

According to their anatomical location, femur fractures are classified into fractures of the femoral head, neck, shaft, trochanteric and condyles. The majority of these fractures can be treated operatively. The procedure of open reduction and internal fixation(ORIF) is a surgical procedure that is used to stabilise and heal a fractured bone. The surgeon secures the

bones in the appropriate position by inserting specialised screws, plates, rods, wires, or nails (Jiang et al., 2021).

Compared to arthroplasty, ORIF may lead to a decrease in infection rates, less blood loss, a shorter operative time, and potentially a lower mortality rate, particularly in youthful and middle-aged patients. Internal fixation is advantageous in the prevention of long-term complications, including necrosis of the femoral head and bone non-union (Lin et al., 2022).

Morbidity, mortality, and health care expenditure are all associated with femur fracture surgery, which is one of the primary orthopaedic surgeries. A complication that may be life-threatening is venous thromboembolism (VTE). An estimated 50% of patients who undergo internal fixation of femur fractures develop deep vein thrombosis (DVT) without prophylaxis, which can lead to a fatal pulmonary embolism (Flevas et al., 2018).

VTE is a significant risk for more than one-third of patients who undergo significant orthopaedic surgeries on a global scale. Nevertheless, the requisite VTE prophylaxis is administered to only a small percentage of these patients (Fischer et al., 2020). The most common causes of VTE in femur fracture internal fixation surgery are immobilisation and dehydration, which are a consequence of the specific surgical type and duration employed. Obesity, advancing age, malignancy, and varicose veins are all risk factors for the development of VTE. The expanded use of prophylaxis, early mobilisation, and enhanced perioperative care has reduced the risk of VTE in patients who have undertaken significant orthopaedic surgical procedures (Forgo et al., 2022).

Hypercoagulability, endothelial injury or dysfunction and haemodynamic alterations (stasis), are the three primary categories of factors that are believed to contribute to thrombosis, as defined by Virchow's triad (Zhang & Li, 2024).

Severe pain, fever, shivering, malaise, swelling, cyanosis of the affected limb, and unilateral oedema are the classical features of DVT. Post-thrombotic syndrome (PTS) is the most prevalent adverse events of DVT. These conditions are characterised by persistent leg pain, oedema, and heaviness (Makedonov et al., 2020).

By averting DVT, the morbidity and mortality rates associated with pulmonary embolism can be effectively reduced. Prevention lessens the economic burden, improves quality of life, shortens rehabilitation times, and shortens hospital stays (Nimeri et al., 2017).

In order to modulate VTE subsequent to a femur fracture, both pharmacological and non-pharmacological preventive strategies may be implemented. At present, the pharmacological agents consist of antiplatelet therapy and anticoagulant therapy. It is imperative that nurses are cognisant of the action of anticoagulant and antiplatelet therapy, its indication, the various routes of administration, contraindications, side effects, warning signs, and the appropriate time to contact medical personnel in order to prevent complications. In addition, they need to be aware of the potential side effects, any medication or food interactions with anticoagulant treatment, the need to educate patients and their families, and the monitoring requirements (Brown et al., 2021). Non-pharmacological interventions include postoperative exercises for the ankle and foot, compression hosiery, limb elevation, and intermittent pneumatic compression as main preventative measures in combination with pharmaceutical interventions (Yu-Fen et al., 2018).

Nurses have a vital role to play in controlling of DVT. They are well placed to evaluate patients' DVT risk as part of their holistic patient assessment and prompt

implementation of appropriate thromboprophylaxis (McHale et al., 2019; Monicka, 2016). They carry out orders of DVT prophylaxis regardless of which modality or combination of modalities and are responsible for on-going administration and monitoring for thromboprophylaxis. Critical functions of nurses in the management of VTE are the assessment, risk stratification, information collection, early ambulation by walker, positioning & leg elevation, post- operative exercises and application of mechanical prophylaxis (compression stocking & intermittent pneumatic compression device) (Campos & Brill, 2019). As a result, nurses are indispensable organisations that can serve as primary healthcare providers in recognising and mitigating the risks of VTE. They are instrumental in the prevention of DVT, despite the fact that physicians are accountable for its definitive treatment (Lavall & Costello, 2015).

In addition to providing education, nursing protocols are an opportunity to guarantee the most optimal patient-centred outcomes and ensure the appropriate continuity of care. Nurses are a critical component in the development of a protocols that are effective on controlling VTE among post- operative patients with femur fracture surgeries.

Aims of the Study:

Evaluate the effect of implementing a nursing protocol, on controlling VTE among postoperative patients with femur fracture surgeries.

Hypothesis of the study

Post-operative patients, with femur fracture surgeries who receive the proposed nursing protocol will show a lower incidence of VTE, than those who receive routine hospital nursing care.

Materials and Method

Materials

Design: To accomplish the objectives of this investigation, a quasi-experimental research design was implemented.

Settings: The current study was carried out at the inpatient and outpatient clinics of El-Hadra Orthopedic and Traumatology Hospital in Alexandria.The inpatient is composed of 5 main units, 2 for males, 2 for females (A and B) and one unit for accidents. Unit A in both male and female units consists of 56 beds. Unit B in both male and female units consists of 42 beds. The accidents unit contains 22 beds. The outpatient clinics are composed of three rooms; a room for diagnosis and follow-up & two physiotherapy rooms.

Subjects: A convenience sample of 60 adult male and female patients. To determine constituted the sample of the study, the following parameters were taken into account: a population size of 70 over a three-month period, an expected frequency of 50%, a maximum error of 5%, a confidence coefficient of 95%, and a minimal sample size of 60 patients. Participants were divided into two equal groups: the control group and the study group. The Epi info-7 program was employed to determine the study sample.

The subjects were adult patients between 20 and 60 years of age, who were able to communicate verbally, scheduled for unilateral femur fracture open reduction and internal fixation surgery, free from any multiple joint involvements, such as rheumatoid arthritis or any other bone/joint disorders, free from any coagulability disorders, had no preexisting hip surgery, and willing to participate in this study

Tools: Seven tools were used for data collection:

Tool I: Femur Fracture Surgery Patients' Knowledge Structured Interview Schedule: This tool was developed in Arabic language after conducting a literature review **(Farag et al., 2017; Garrison, 2019; Serpici & Gürsoy, 2018)**. Its aim was to evaluate fracture femur patients' knowledge of anticoagulant therapy and venous

thromboembolism. The study was divided into three sections: part (1) provides socio-demographic and clinical data, such as age, gender, area of residence, marital status, and level of education, occupation, monthly income and treatment system. Patients' clinical data covered medical history, family history related DVT, previous hospitalization, admission, previous surgery, operation date, hospital stay days and discharge date. Part II was composed of seventeen questions with fixed alternatives that were used to assess baseline knowledge of patients about venous thromboembolism in relation to the items: Characteristics of veins, meaning of venous thromboembolism (VTE) and meaning of deep vein thrombosis (DVT), while, part III included seventeen questions such as action, indications, contraindication, the side effects of anticoagulant therapy as well as antiplatelet drugs, and the different routes of medication administration.

Scoring System: The patient's knowledge answers scored on 3 points likert scale: (0) was given for wrong answer or don't know, while (1) was given for correct and incomplete answer, and (2) was given for correct and complete answer. A total score of every patient summed up and converted into percent score. The percentage of the total score was classified as follows: a score of 50% was considered poor, a score of 50% to less than 75%, was considered fair, and score of 75% and more was considered good knowledge level.

Tool II: Autar DVT Scale (Autar DVT): This tool was adopted from **(Shaaban, 2021; Wallis & Autar, 2001),** it was used for both study group, it was implemented within the initial 24 hours of admission to evaluate patients who were susceptible to DVT. Seven risk categories were identified: age-specific group, build/body mass index (BMI), mobility, special DVT risk, trauma, surgery, and high-risk disease. The assessment comprised seven risk

categories: the age-specific group scored from 0 to 4, body mass index (BMI) scored from 0 to 4, mobility scored from 0 to 4, special DVT risk scored from 1 to 3, trauma scored from 1 to 4, surgery scored from 1 to 4, and high-risk disease scored from 1 to 7. Each of these categories contributed to the overall risk evaluation for DVT.

Scoring System: Each risk category was given a score and the total score was added up to find the patient risk category. The overall score offers predictive DVT index, risk categories were classified as follows: < (6) score was given for no risk, while a score from (6) to (10) was given for low risk, a score from (11) to (14) was given for moderate risk, and a score ≥ (15) was given for high risk.

Tool III: Korean Version of the Hill-bone Medication Adherence Subscale(HBMA-K): The tool was translated and adopted from **Azzam (2021)**, in order to evaluate patients' compliance with anticoagulant medications.

Scoring System: HBMA-K was consisted of nine categories; each category was rated on a four points Likert scale. Scale: 1 indicated"never", 2 indicated "some of the time ", 3 indicated "most of the time ", and 4 indicated "all of the time ". The total score ranged from 9 to 36, higher scores (36) reflected "poorer adherence to anticoagulant medication" and lower scores (9) reflected "good adherence to anticoagulant medication.

Tool IV: Ankle and Foot Range of Motion Assessment: This tool was adopted from **Konor et al., (2012)**, it was used to assess patient`s range of motion (ROM) for ankles as dorsiflexion, Planter flexion, inversion and eversion of the affected limb using Myrin goniometer. . The measurement of joint range of motion was compared against the normal value of each range of motion as follows: planter

flexion, dorsiflexion, eversion, and inversion

Scoring System: The measurement of joint range of motion was compared against the normal value of each range of motion as follows: Plantar flexion (0 to 50 degree), dorsiflexion (0 to 20 degree), inversion (0 to 35 degree), eversion (0 to 25 degree0).

Tool V: Safe Use of Mechanical Prophylaxis Observational Checklist: This tool was developed by the researcher based on literature review **(Khalil, 2021; Lim & Davies, 2014; Taylor, 2018)** to assess study subjects performance while using mechanical prophylaxis. It is composed of two parts, part (1): safe use of compressing stocking observational checklist and part (2): use of intermittent pneumatic compression device checklist.

Scoring System: The patient's practice answers scored on 3 points likert scale: (0) was given for wrong answer or don't know, while (1) was given for correct and incomplete answer, and (2) was given for correct and complete answer. A total score of every patient summed up and converted into percent score. The percentage of the total score was classified as follows: a score of 50% was considered poor, a score of 50% to less than 75%, was considered fair, and score of 75% and morewas considered good practice level.

Tool VI: Safe Use of Mobility Aids (Walker) observational checklist: The tool was developed based on literature review **(Taylor, 2018)** to assess study subjects performance of using the walker while walking, sitting and going up & down stairs. **Scoring System:** mentioned above in tool V.

Tool VII: DVT Incidence Monitoring: This tool was adopted from **(Shaaban, 2021)**. It was used to monitor study subjects incidence of DVT. It is comprised of two components: Section 1: "DVT leg manifestations observational checklist" and Section 2: "DVT confirming diagnostic

study." The tool included 9 items with "present" or "absent" answers. It was represented statistically as numbers and percent.

Methods

Approval of the Research Ethics Committee, Faculty of Nursing, Alexandria University was obtained. An official letter was issued from the Faculty of Nursing, Alexandria University to the study setting to obtain their permission to collect necessary data. An official permission was obtained from the directors and head of the Surgical Orthopedic Department of El-Hadra Orthopedic and Traumatology University Hospital after explaining the aim of the study. IRB00013620 (9/19/2025)

Reliability: The Cronbach's alpha coefficient was used to evaluate study tools reliability. Tool, coefficient of reliability was (0.808), tool coefficient of reliability was (0.99), and tool VI coefficient of reliability was (0.806). Tool II, III, IV, and VII were adopted, all, were reliable.

Validity: For content and construct validity, the tools were submitted to two orthopaedic surgery experts and three Medical Surgical Nursing experts, and modifications were implemented accordingly.

Pilot study: Applicability of the tools, a pilot study was implemented on six patients. Modifications were implemented; these six patients were not included in the study sample.

Proposed nursing protocol: The content of the nursing protocol was organized according to a feasible learning sequence (from easy to difficult) to enhance patients' understanding. It was presented in theoretical and practical parts. The theoretical part was covered Information about venous thromboembolism ,anticoagulant therapy and discharge plan, while the practical part

included safe use of mechanical prophylaxis (compression stocking and intermittent pneumatic compression device), ankle range of motion& foot pumping exercise and safe use of mobility aids.

Data collection:

- After securing the administrative approval, the data collection was started, and continued for a period of 6months from February 2024 to July2024.

- The data was collected from the control group patients first, then the study group patients to prevent data contamination.

- To fulfill the study aim, the nursing protocol was carried out for the patients in the studied group in four phases: assessment, planning, implementation, and evaluation.

- The structured tools were used to collect data to achieve the objective of the study and obtain baseline data for future comparison. The data was collected by the researcher for each patient using individualized interview.

- Data was collected from orthopedic surgery department preoperative, postoperative, and from outpatient clinics.

Phase I: Assessment Phase:

- On admission the researcher introduced herself to every patient and builds a therapeutic relationship to gain cooperation after explaining the purpose of the study.

- Written informed patients' consent was obtained before data collection and after explanation of the study aim.

- The initial assessment was carried out preoperatively for all patients (studied and control groups) undergoing open reduction and internal fixation of femur fracture using all tools expect tool VII to collect baseline patients' data, assess patient who are at high risk for VTE, assess patients' knowledge about venous thromboembolism, anticoagulant therapy and assess ankle and foot ROM exercise.

- Assessing patient's Adherence to medication, patient's practice regarding use of mechanical prophylaxis and safe use of walker were assessed on 1st& 2nd post-operative day.

Phase II: Planning phase:

Based on the data collected from the assessment phase and literature review the nursing protocol goals, priorities, contents, and expected outcomes were developed by the researcher according to the patients' individual needs.

Goals and expected outcomes of the nursing protocol:

The patient was able to:

- Explain meaning of DVT & PE, signs &symptoms, causes, risk factors and treatment modalities

- Discuss anticoagulant drugs its action, indication, contraindication and side effects.

- Adhere to anticoagulant therapy.

- Perform ankle/ feet ROM exercise correctly.

- Use mechanical prophylaxis (compression stocking) correctly.

- Use of mobility aid (walker) safely and correctly.

Booklet

It was written in a simple Arabic language and supplemented by photos and illustrations to help the patients understand the content & remind them with the instructions and exercises. It was provided to all patients in the studied group.

Content

It included:

- Information about venous thromboembolism, anticoagulant therapy and discharge plan.

- Safe use of mechanical prophylaxis (IPCD & compression stocking).

- Diet and hydration status

- Ankle range of motion, foot pumping and deep breathing exercise.

- Safe use of mobility aid (walker)

Phase III: Implementation phase:

Nursing protocol for patients undergoing

open reduction and internal fixation of femur fracture was implemented individually for each patient in the above-mentioned settings in 3 sessions.

Each session took approximately 45-60 minutes depending on each patient's physical and psychological ability.

The first session: It took place in the pre-operative day. It included theoretical information that was given preoperatively related to venous thromboembolism about the definition, risk factors, manifestation, complications, prevention, anticoagulant therapy, action, indications, contraindications, side effects, routes of administration, safe precautions, and importance of adherence.

The second session: This session was on the second postoperative day, the researcher was demonstrated to the patient how to get in and out of bed, how to use IPCD and walker safely and correctly, demonstrate and practice ankle and foot ROM and foot pumping exercise.

The third session: This session was on the third postoperative day aimed to demonstrate information about safe ways to use mechanical prophylaxis (compression stocking), follow-up every week.

- Phone contact was maintained between the researcher and patients to reinforce the importance of doing exercise & wearing compression stocking and ensure follow-up visits in outpatient clinics.

Phase IV: Evaluation phase

The patients undergoing open reduction and internal fixation of femur fracture was evaluated by the researcher after implementation of the nursing protocol two times, one week & one month after discharge, using all study tools except tool II and part two from tool V (Use of intermittent pneumatic compression device checklist) was evaluated on the third post - operative day, while tool VII (DVT incidence monitoring) was used post one month of implementation of the nursing protocol.

Ethical considerations: Written informed patients' consent was obtained before data collection and after explanation of the study aim. The patient was informed that his or her participation in the study is voluntary and he/she can withdraw at any time and his or her withdrawal was not affect the care he/she received at the hospital. Privacy and anonymity of the study participants was asserted. Confidentiality of the collected data was assured.

Statistical analysis: Data inputted into the computer were subjected to analysis with IBM SPSS software, Version 20.0. (Armonk, NY, IBM Corporation) The qualitative data was characterized using percentages and numerical values. Shapiro-Wilk test was implemented to verify the distribution's normality. To describe the quantitative data, the following attributes were employed: mean, standard deviation, median, and range (minimum and maximum). A significance level of 5% was used to evaluate the results. Categorical variables were compared between distinct groups using the chi-square test. Quantitative variables that were normally distributed were compared between the control and studied groups using the student t-test. The Z-test was employed to assess the significance of the percentage differences between the two groups that were the subject. Paired t-tests were implemented to investigate the differences within each group between the pre- and post-implementation of the nursing protocol. Cronbach's Alpha was implemented to assess reliability statistics.

Results

Table 1: shows that there were no statistical significant differences in sociodemographic characteristics among patients in either group (p > 0.05).

Table 2: indicates that there were no statistical significant differences among the two group subjects in terms of all clinical data characteristics (p>0.05).

Table 3: displays that all patients of studied group had poor overall score of knowledge pre implementation of nursing protocol. While post implementation of nursing protocol they showed a great improvement in their overall score of knowledge with a statistical significant difference (t=61.75 p<0.001***). Furthermore, it was observed that there was a statistical significant difference between control and studied group patients post implementation of nursing protocol (t-test=21.48, p<0.001***). On the other hand, all (100%) of control group patients had poor knowledge overall score pre and post implementation of nursing protocol.

Table 4: shows that the majority 83.3% of the studied group patients had poor medication adherence pre implementation of the nursing protocol, while great improvement has been observed where all patients had high medication adherence post one week, one month from the implementation the nursing protocol. On the other hand, it was found that 83.3%, 83.3%, 66.7% respectively of the control group patients had poor adherence pre and post one week, one month of implementing the nursing protocol. There was high statistical significant difference between the studied and control groups post one week, & one month of implementing the nursing protocol (t-.test=20.03, p=<0.001***), (t-test=18.45, p=<0.001***) respectively.

Table 5: reveals that there was a great improvement regarding mean score of total ankle range of motion assessment of the studied patients post implementation of the nursing protocol. A statistical significant difference had been seen between pre and post 1weeks & 1months (t= 10.53, p4<0.001***, t=15.92, p5<0.001***). Furthermore, as regards the mean score of the total ankle range of motion assessment there was a statistically significant difference between controlled and studied patients one week, & one month post implementation of the nursing protocol (t-test=9.34, p<0.001***, t-test=13.60,

p<0.001***) respectively.

Table 6: depicts that all control group patients had poor practice regarding safe use of compression stocking pre, and post implementation of nursing protocol. On the other hand, it was found that all patients of studied group patients had poor level of practice regarding safe use of compression stocking pre implementation of nursing protocol, while post implementation they showed gradual improvement in their level of practice with a statistical significant difference (t=59.98p5<0.001***) (t=6.18, p6<0.001***). Furthermore, it was observed that there was a statistical significant difference between control and studied group patients post one week, & one month of implementation the nursing protocol (t-test=35.02, p2<0.001***, t-test=50.45, p3<0.001***) respectively.

Table 7: shows that all (100%) of control group patients had poor practice regarding safe use of walker pre and post implementation of nursing protocol with no significant difference. On the other hand, it was found that the majority (96.7%) of studied group patients had poor level of practice regarding safe use of walker pre implementation of nursing protocol, which showed improvement reached good level of practice post one week, & one month from implementation of nursing protocol (83.3%, 76.7%) respectively. with significant difference (t=41.40 p<0.001***). Furthermore, it was observed that there was a statistical significant difference between control and studied group patients post one week, & one month implementation of nursing protocol (t-test=24.80, p<0.001***, t-test=18.40, p<0.001***) respectively.

Table 8: depicts that 30% of controls had DVT in the right lower limb and 20% of them had DVT in the left lower limb following implementation of the nursing protocol as confirmed by (Doppler). Conversely, it was determined that the nursing protocol resulted in absence of DVT in the majority of the study group

(96.7%). Additionally, it was noted that the control and studied group patients exhibited a high statistically significant difference following implementation of the nursing protocol ($\chi 2$=16.86 p=<0.001***).

Discussion:

Venous thromboembolism is a prevalent and severe complication that frequently arises as a result of femur fracture surgeries (Mihara et al., 2020).Therefore, it is extremely important to prevent a symptomatic VTE; however, the preconception identification of high-risk patients who may develop mortal VTE remains a challenging endeavour. There is controversy concerning the necessity of routine use of anticoagulants after femur fracture surgeries to prevent thrombosis. Undetected or inadequately treated DVT may cause pulmonary embolism, which is often fatal (Lavall & Costello, 2015).

On the vanguard of DVT control, nurses are responsible for risk assessment, the application of chemical and mechanical prophylaxis, and the provision of essential educational and psychological support to patients. Additionally, nursing interventions offer the chance to guarantee the most favourable patient-centred outcomes and ensure the correct continuity of care.

The results indicated that, with respect to **socio-demographic and clinical data,** The results of the current study indicated that the majority of the participants in both categories were married and females in terms of their marital status and gender. Hormonal alterations that occur as a consequence of pregnancy and the use of contraceptive medication may be linked to this outcome. The physiological changes that occur during pregnancy, such as increased blood volume, weight gain, elevated intra-abdominal pressures, and reduced venous return, are significant contributing factors. These findings can be attributed to the fact that they increase the probability of DVT. Support for this conclusion was provided by Kılıç et al. (2022) She showed that over half of her subjects were married women. This doesn't lie in agreement to Soydan et al. (2017) According to her study's findings, the ratio of males to females was 2.4, and the preponderance of the patients were males.

In relation to patient's age, it was revealed that the age group of forty to less than fifty comprised the maximum percentage in the current study. The findings showed that patient age had a significant impact on the likelihood of developing DVT, with the risk increasing with older age. This may be due to the fact that aging process is associated with vascular wall smooth muscle atrophy and degeneration leading to venous dilatation. This result is in contrast with Kiliç et al. (2023), who indicated that the preponderance of his study subjects were within the same age category of the present study.

Concerning occupations, the present study indicates that the majority of both categories were housewives who were engaged as clergy. These findings can be attributed to the fact that protracted periods of standing or seating can contribute to venous blood stasis, according to the researcher, weak calf muscle, and incompetent valves, which can result in ineffective venous return. This finding is in the same line with Neeman et al. (2022), who informed a higher percentage of DVT in patients who reclined for an extended period of time or stood during work.

Concerning presence of associated chronic diseases, according to the present study, diabetes mellitus and hypertension were present in over one-third of both sample categories. This conclusion is consistent with Gromadziński et al. (2023) who reported that hypertension is the most common risk factor for DVT, as well as, edema was more associated with hypertensive patients in this study.

Regarding patients' level of knowledge

about VTE, Pre-implementation of the nursing protocol, the current findings indicated that all patients in the studied groups possessed inadequate knowledge regarding anticoagulant therapy and deep vein thrombosis (DVT). This result may be due to lack of medical consultation, lack of communication between patients and health team members due to high patient's rates and presence of only one nurse in the ward and outpatient clinics, as observed during the current study data collection. These finding is in line with Nowak et al. (2021), who noted that, most of the patients are not familiar with vascular diseases and its managements.

This result disagreed with (Lavall & Costello, 2015) findings who reported that there was no paucity of knowledge for patients and health care team provides sufficient information regarding venous thrombo embolism in Rhode Island, U.S.A. Additionally, the results of the current investigation demonstrated that patients in the study group experienced a significant statistically significant increase in their level of knowledge subsequent to the implementation of the nursing protocol. This current result is in agreement with González-Mares et al. (2022), who asserted that educational intervention led to a statistically significant increase in knowledge scores. Furthermore, half of the patients who successfully completed the educational intervention were completely free of disease recurrence. From the researcher point of view, the observed improvement of studied group patients' knowledge level might be due to the sessions that carried out by the researcher to our patients, which included knowledge and health instructions about DVT and coagulant therapy using different teaching strategies and different educational methods as discussion, coloured booklet, reinforced by telephone contacts.

As regards medication adherence sub-scale (HBMA-K), according to the present findings, the nursing protocol was not adhered to by the majority of both groups

prior to its implementation. A lack of cognition regarding significance of medication adherence and inadequate comprehension of DVT and its complications may be the cause of this outcome. This was also supported by Tran et al. (2023), who showed that low adherence was related to concerns about adverse drug reactions, symptoms severity, fear of regular blood test, inability to attend frequent clinical visits and comorbidities.

The present results also indicated that the adherence rate of e patients in the studied group was higher than that of the controls, after one week and a month of the nursing protocol's implementation. This current outcome is consistent with Park and Jang (2021), who asserted that educational interventions led to a statistically significant increase in adherence levels. This can be explained by the fact that, the observed improvement of studied group patient's adherence level might be due to the received explanation by the researcher concerning medications management such as action, indication, contraindication, potential side effects and nursing role of anticoagulant therapy in preventing complications such as bleeding.

Concerning ankle range of motion assessment, the results of the present study revealed that there was a great improvement in ankle range of motions of the majority of the studied group who practice full range of motion of ankle joint concerning dorsiflexion, plantar flexion, inversion and eversion one month post implementation of the nursing protocol, with a statistical significant difference between controlled and studied groups. The continuous application of ROM exercises by studied patients as instructed by the researcher, which included three sets of exercises: ankle circumduction exercise, ankle dorsiflexion and plantar flexion using resistance band justify the great improvement of patients' practice ROM exercise of ankle joint. This result is agree with the study done by Volpe et al. (2020),

who explained that ankle-joint movement is decreased and is associated with a higher risk of blood stasis. Conversely, satisfactory ankle dorsiflexion and effective function of the calf-muscle pump prevents oedema and venous stasis.

In relation to patients' practices regarding safe use of compression stocking, the present study showed that both control & studied groups patients had poor practice level regarding safe use of compression stocking pre implementation of nursing protocol. This may be due to absence of the importance of VTE prophylaxis especially mechanical prophylaxis in the hospital policy. Additionally lack of nurses' knowledge and skills to apply the compression stocking for patients. This study supported from Khalil (2021) who reported that nurses had poor practice level regarding use of mechanical prophylaxis of VTE.

However, this is in contrast with Jock (2020) in their study who found that there were hospital policies concerning importance of VTE mechanical prophylaxis. The findings of the current study showed that, the majority of studied group patients had significant improvement in their level of practice regarding safe use of compression stocking post implementation of nursing protocol. It may be due to the acquired knowledge, and practice of wearing, & removing the compression stocking together the explained precautions.

As regards the patients' practices regarding safe use of mobility aid (walker), the present study findings revealed that all patients of control & studied groups had poor level pre implementation of the nursing protocol, in relation to standing, waking, sitting, going up & down stairs by the walker. This result may be due to there was lack of nurse's knowledge and skills at inpatient and outpatient clinics, lack of communication between patients and health team members

to explain these items due to high patient's rates and there was only one nurse only at the ward and outpatient clinic, as observed during current study data collection period. Similar outcomes were reported by (Weheida et al., 2021), who noted that, the nurses had poor practice level regarding safe use of walker for post major orthopedic surgery patients.

Furthermore, the findings of the present study showed that there was a high statistically significant improvement in the studied group patient's practice level one week & one month post implementation of the nursing protocol. The current result in agreement with Zang et al. (2020), who stated that early mobilization was associated with a shorter length of stay in hospital, lower complication rate, speed up velocity of blood flow in lower limbs, increased walking ability compared to those with late mobilization. This can be explained by the fact that the patients felt that walker will be help them to move around & not to be confined to a chair or certain area, and that they were convinced with the instructions provided by the researcher concerning the importance of walking to prevent blood stasis & development of DVT.

As regard to DVT incidence monitoring, it was observed that the clinical assessment of the studied group patients improved after the nursing protocol was implemented. This was evidenced by the absence of leg warmth and tenderness, and a minimal number of patients reported oedema, cramping, or redness. This could be attributed to the enhancement of knowledge and implementation of the instructions regarding preventive measures. This study's conclusion was consistent with (Barfod et al., 2020) who showed that the clinical assessment of the studied group improved after the intervention, as evidenced by the absence of warmth and tenderness in the limb, in contrast to the control group, which adhered solely to routine care.

A significant improvement in Doppler ultrasound related to VTE risk was found among the patients in the studied group, according to the findings of the current investigation. Compared to the control group, the diagnostic results indicate that the majority of studied group patients were free from DVT.

In contrast to fifteen patients in the control group who developed DVT, the current study results indicate that only one patient from the study group developed DVT. The study group's patients were instructed on preventive measures that combined two prophylactic strategies: the pharmacologic approach, which involved administration of anticoagulants, and the mechanical approach, which involved correct use of elastic compression stoking and walker, and ankle exercises. Patients' practices were significantly altered as a consequence.

Compression stroking increases the velocity of venous blood flow and prevents venous stasis in the legs, while the anticoagulants suppress blood hypercoagulability. There outcomes were consistent with Ahuja et al. (2016), who found that although no patients in the research group had deep vein thrombosis (DVT), two in the controls did. A previous Japanese study revealed that working the legs while lying down using a variety of exercise techniques improved venous flow to the lower extremities. Consequently, it could be useful for avoiding deep vein thrombosis in the legs. Shimizu et al. (2017). This result is not lined with (Fuji (2016)) who studied the risk of deep vein thrombosis (DVT) in orthopaedic patients and compared the efficacy of various preventative strategies, including mechanical and pharmaceutical ones. The investigation revealed a range of 6.0% to 13.0% of DVT incidence. In patients who underwent femur fracture interventions and were administered the nursing protocol, the proposed hypothesis was confirmed by the results of the current study. These patients

demonstrated an improvement in their health outcomes. Therefore, continuously nursing interventions should be provided for those patients on regular basis to increase adherence to follow-up treatment. In order to prevent the development of DVT and aid patients in adjusting to their new life circumstances, nursing protocol should be considered an essential component of hospital's routine care for patients who have undergone femur fracture surgeries.

Conclusion

Based on the study findings, it can be concluded that the nursing protocol for patients undergoing femur fracture surgeries showed positive results in relation to controlling of VTE. Furthermore, the nursing protocol implementation demonstrated positive health outcomes of the studied patients as evidenced by improvement in patients' knowledge level regarding VTE and anticoagulant- therapy post implementation of the nursing protocol. Also the studied patients had improvement regarding total range of motion assessment score compared to the controls

Additionally, there were positive outcomes in relation to patients' practice level regarding safe use of mechanical prophylaxis and Waller evidenced by improved overall per cent score of practice of studied patients with statistical significant differences among the control and studied groups regarding post one months of implementation the nursing protocol.

Also, the study results revealed that the majority of studied group patients had high level adherence to anti-coagulant medication post one week, one month implementation of the nursing protocol.

Finally, the present study results demonstrated significantly better in Doppler ultrasound related to VTE risk among the study group patients. These diagnostic results indicate a better blood clotting profile among the study group patients compared to the control group,

with associated lower risk of VTE development.

Recommendations

The following recommendations are derived and suggested in accordance with the results of the current study:

Recommendations for patients:

1. Application of educational sessions for patients with femur fracture surgeries to improve their knowledge about DVT, treatment methods, health practices and structured exercises that help in DVT prevention.
2. Patients having femur fracture surgery should have access to a DVT prevention health education brochure or coloured illustrated educational booklet.

Recommendations for nurses:

1. In-service training programs should be carried out for nurses working at orthopedic department about structured exercise programs for controlling VTE among femur fracture surgery patients
2. Nurses should receive updated instructional guidelines about DVT prevention.

Recommendations for further studies:

1. Standard program for nurses about controlling of VTE among post major orthopedic surgery patients should be developed.
2. The present study should be replicated on larger study populations in different settings in Egypt for generalization of the findings.

Table (1): **Frequency distribution of control and studied patients with femur fracture surgeries according to socio-demographic characteristics**

Socio-demographic characteristics	Items	Total (n=60)		Studied group (n=30)		Control group (n=30)		Test of Significance
		No.	%	No.	%	No.	%	
Gender	Female	33	55.0%	16	53.3%	17	56.7%	χ²=0.07 p=0.795
	Male	27	45.0%	14	46.7%	13	43.3%	
Age	20 -< 30 Years	8	13.3%	3	10.0%	5	16.7%	χ²=14.14 p=0.003
	30 -< 40 Years	19	31.7%	11	36.7%	8	26.7%	
	40 -< 50 Years	24	40.0%	7	23.3%	17	56.7%	
	50 -≤ 60 Years	9	15.0%	9	30.0%	-	0.0%	
	Mean ± S.D.	40.7 ± 9.1		42.3 ± 10.2		39 ± 7.7		t=1.43 p=0.157
Level of Education	Illiterate	2	3.3%	2	6.7%	-	0.0%	χ²=4.33 p=0.363
	Read And Write	9	15.0%	5	16.7%	4	13.3%	
	Basic Education	6	10.0%	4	13.3%	2	6.7%	
	Secondary	24	40.0%	9	30.0%	15	50.0%	
	University	19	31.7%	10	33.3%	9	30.0%	
Occupation	Manual	4	6.7%	2	6.7%	2	6.7%	χ²=0.84 p=0.841
	Cleric Work	25	41.7%	14	46.7%	11	36.7%	
	House Wife	28	46.7%	13	43.3%	15	50.0%	
	Not Working	3	5.0%	1	3.3%	2	6.7%	
Marital Status	Single	10	16.7%	5	16.7%	5	16.7%	χ²=3.22 p=0.359
	Married	38	63.3%	18	60.0%	20	66.7%	
	Divorced	3	5.0%	3	10.0%	-	0.0%	
	Widow	9	15.0%	4	13.3%	5	16.7%	
Area of Residence	Urban	42	70.0%	20	66.7%	22	73.3%	χ²=0.32 p=0.573
	Rural	18	30.0%	10	33.3%	8	26.7%	
Monthly Income	Not Enough	47	78.3%	24	80.0%	23	76.7%	χ²=0.10 p=0.754
	Enough	13	21.7%	6	20.0%	7	23,3%	
Treatment System	Private	29	48.3%	16	53.3%	13	43.3%	χ²=0.60 p=0.438
	University Free Hospital	31	51.7%	4	46.7%	17	56.7%	

χ2: Chi-Square test, statistically significant at $p \leq 0.05$, p: p value for comparing between the studied and control groups

Table (2): Frequency distribution of control and studied patients with femur fracture surgeries according to clinical data

Clinical data	Items	Total (n=60)		Studied group (n=30)		Control group (n=30)		Test of Significance
		No.	%	No.	%	No.	%	
Medical History for Chronic Diseases#	No	29	48.3%	15	50.0%	14	46.7%	χ^2=0.07 p=0.796
	Yes	31	51.7%	15	50.0%	16	53.3%	
	1- Cardiovascular Diseases	9	15.0%	7	23.3%	2	6.7%	Z=1.81 p=0.071
	2- Endocrine Diseases	-	0.0%	-	0.0%	-	0.0%	n/a
	3- Diabetes Mellitus	21	35.0%	10	33.3%	11	36.7%	Z=0.27 p=0.787
	4- Hypertension	25	41.7%	12	40.0%	13	43.3%	Z=0.26 p=0.793
	5- Kidney Diseases	6	10.0%	2	6.7%	4	13.3%	Z=0.86 p=0.389
	6- Others	-	0.0%	-	0.0%	-	0.0%	n/a
Family History of Deep Vein Thrombosis	No	46	76.7%	23	76.7%	23	76.7%	n/a
	Yes	14	23.3%	7	23.3%	7	23.3%	
	1-Father	4	6.7%	3	10.0%	1	3.3%	Z=1.034 p=0.301
	2-Mother	10	16.7%	4	13.3%	6	20.0%	Z=0.69 p=0.488
	3-First Class Relative or other	-	0.0%	-	0.0%	-	0.0%	n/a
Previous hospitalization	No	35	58.3%	15	50.0%	20	66.7%	χ^2=1.71 p=0.190
	Yes	25	41.7%	15	50.0%	10	33.3%	
	Never	34	56.7%	14	46.7%	20	66.7%	χ^2=7.59 p=0.055
	One Time	4	6.7%	1	3.3%	3	10.0%	
	Two Times	17	28.3%	10	33.3%	7	23.3%	
	Three Times	5	8.3%	5	16.7%	-	0.0%	
Previous Surgery$	No	43	71.7%	17	56.7%	26	86.7%	χ^2=6.65 p=0.009
	Yes	17	28.3%	13	43.3%	4	13.3%	
	CS	6	35.3%	3	23.1%	3	75.0%	χ^2=5.89 p=0.318
	Hernia	2	11.8%	1	7.7%	1	25.0%	
	Open Heart	4	23.5%	4	30.8%	-	0.0%	
	PCI	1	5.9%	1	7.7%	-	0.0%	
	Splenectomy	3	17.6%	3	23.1%	-	0.0%	
	Stone Removal	1	5.9%	1	7.7%	-	0.0%	

Z: Z-test to test significance between two group percentages
χ^2: Chi-Square test
Statistically significant at p ≤ 0.05
p: p value for comparing between the studied and control groups
#: Sum of incidence percentages of all possible Medical History for Chronic Diseases might exceed 100% because of cases having multiple concurrent diseases simultaneously.
$: Percentages of individual types of surgeries have been calculated from the total number of yesses (Only those claimed having previous surgeries), as there was no multiple surgeries for each subject, thus their percentages sum to 100% .

Table (3): Comparisons between control and studied patients with femur fracture according to overall score of knowledge level pre and post implementation of the nursing protocol

Knowledge Overall Score	Studied group				Control group				Test of significance	
	Pre		Post		Pre		Post		Pre	Post
	No.	%	No.	%	No.	%	No.	%	(p₁)	(p₂)
Poor (<50%)	30	100.0%	-	0.0%	30	100.0%	29	-	n/a	$\chi2=56.333$ p=<0.001***
Fair (50-<75%)	-	0.0%	11	36.7%	-	0.0%	1	3.3%		
Good (75-100%)	-	0.0%	19	63.3%	-	0.0%	-	0.0%		
Mean Score									t-test=1.14	t-test=21.48
Mean ± S.D.	1.17 ± 1.26		51.27 ± 4.53		2.57 ± 6.63		4.80 ± 10.95		(p=0.265 ns)	(p<0.001***)
Paired t (p3)	t=61.75 p<0.001***				t=1.37 p=0.182 ns					

T- test : Student's t test, χ2: Chi-Square test, Paired t: Paired t-test bet. Pre- and Post., p1: p value bet. study and controls Pre-implementation, P2: p value bet. study and controls **post-implementation**, p3: p value bet. Pre- and Post- among each **group**, Statistically highly significant at p<0.001***, ns: Not-statistically significant

Table (4): **Comparisons between control and studied patients with femur fracture surgeries as regards medication adherence sub-scale (HBMA-K) pre, one week, & one month post implementation of the nursing protocol**

Medication Adherence	Items	Studied group						Control group						Test of Significance		
		Baseline		1 Week		1 Month		Baseline		1 Week		1 Month				
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	p_1	p_2	p_3
HBMA_K	High Adherence <50%	-	0.0%	30	100.%	30	100 %	1	3.3%	2	6.7%	2	6.7%	$\chi2=1.111$ p=0.574 ns	$\chi2=52.5$ p=<0.001***	$\chi2=52.5$ p=<0.001***
	Mod Adherence. 50-<75%	5	16.7%	-	0.0%	-	0.0%	4	13.3%	3	10.0%	8	26.7%			
	Poor Adherence 75%+	25	83.3%	-	0.0%	-	0.0%	25	83.3%	25	83.3%	20	66.7%			
	Mean ± S.D.	22.37 ± 1.79		5.40 ± 1.92		5.27 ± 1.91		21.30 ± 3.90		21.57 ± 3.98		20.60 ± 4.13		t-test=1.36 (p=0.178 ns)	t-test=20.03 (p<0.001***)	t-test=18.45 (p<0.001***)
	Mean % ± S.D.	82.84 ± 6.63		20.00 ± 7.12		19.51 ± 7.08		78.89 ± 14.43		79.88 ± 14.74		76.30 ± 15.30				
	Paired t	t=32.93 p_4<0.001***		t=36.15 p_5<0.001***		t=0.38 p_6=0.707 ns		t=0.45 p_4=0.658 ns		t=0.93 p_5=0.360 ns		t=2.23 p_6=0.033*				

T – test : Student's t test, Paired t: Paired t-test bet. Pre- & Post, χ2: Chi-Square test. p1: p value bet. study & controls Pre-implementation, P2: p value bet. study & controls after 1 Week, P3: p value bet. study & controls after 1 Month, p4: p value bet. Pre - & 1 Week (among each group), p5: p value bet. Pre- & 1 Month (among each group), p6: p value bet. 1 Week & 1 Month (among each group), ns: Not-statistically significant*. *** Statistically highly significant at p<0.001

Table (5): Comparisons between control and studied patients with femur fracture surgeries regarding total ankle range of motions assessment pre, one week, & one month post implementation of the nursing protocol

Total ankle range of motions assessment	Items	Studied group						Control group						Test of Significance		
		Initial		1 Week		1 Month		initial		1 Week		1 Month				
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	p_1	p_2	p_3
Total ankle/Foot Range of Movement	No Motion<50%	13	43.3%	-	0.0%	-	0.0%	11	36.7%	11	36.7%	11	36.7%	$\chi2$=0.278 p=0.598 ns	$\chi2$=44.167 p=<0.001***	$\chi2$=60 p=<0.001***
	Motion with Limitation 50-75%	17	56.7%	5	16.7%	-	0.0%	19	63.3%	19	63.3%	19	63.3%			
	High/full Mobility 75%+	-	0.0%	25	83.3%	30	100%	-	0.0%	-	0.0%	-	0.0%			
	Mean ±S.D.	2.60 ± 1.75		6.37 ± 1.10		7.63 ± 0.61		2.53 ± 1.96		2.53 ± 1.96		2.53 ± 1.96		t-test=0.14 (p=0.890 ns)	t-test=9.34 (p<0.001***)	t-test=13.60 (p<0.001***)
	Paired t	t=10.53 p4<0.001***		t=15.92 p5<0.001***		t=6.62 p6<0.001***		n/a		n/a		n/a				

T-test : Student's t test   Paired t: Paired t-test bet. Pre- & Post, χ2: Chi-Square test**.** p1: p value bet. study & controls Pre-**implementation, P**2: p value bet. study & controls after 1 Week,P3: p value bet. study & controls after 1 Monthns: Not-statistically significant, ***: Statistically highly significant at p<0.001

Table (6):   Comparisons between control and studied patients with femur fracture surgeries regarding overall score of safe use of compression stocking pre, one week & one month post implementation of the nursing protocol

Safe use of compression stocking	Items	Studied Group						Control Group						Test of Significance		
		Initial (pre)		Post 1 Week		Post 1 Month		Initial (pre)		Post 1 Week		Post 1 Month				
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	p_1	p_2	p_3
Overall Score	Poor Practice Level <50%	30	100.0%	-	0.0%	-	0.0%	30	100.0%	30	100.0%	30	100.0%	n/a	$\chi2$=60 p=<0.001***	$\chi2$=60 p=<0.001***
	Fair Practice Level 50-75%	-	0.0%	30	100.0%	22	73.3%	-	0.0%	-	0.0%	-	0.0%			
	Good Practice Level 75%+	-	0.0%	-	0.0%	8	26.7%	-	0.0%	-	0.0%	-	0.0%			
	Mean ±S.D.	0.00 ± 0.00		29.43 ± 2.61		33.13 ± 3.03		1.67 ± 3.57		1.63 ± 3.48		0.57 ± 1.83		t-test=2.56 (p=0.016*)	t-test=35.02 (p<0.001***)	t-test=50.43 (p<0.001***)
	Paired t	t=61.80 p4<0.001***		t=59.98 p5<0.001***		t=6.18 p6<0.001***		t=1.00 p4=0.326 ns		t=1.88 p5=0.070 ns		t=1.89 p6=0.069 ns				

T-test : Student's t test   Paired t: Paired t-test bet. Pre- & Post, χ2: Chi-Square test. p1: p value bet. study & controls Pre-**implementation, P**2: p value bet. study & controls after 1 Week,P3: p value bet. study & controls after 1 Monthns: Not-statistically significant, ***: Statistically highly significant at p<0.001

Table (7): **Comparisons between control and studied patients with femur fracture surgeries regarding total score of safe use of mobility aid (walker) pre, one week & one month post implementation of the nursing protocol**

Items		Studied Group						Control Group						Test of Significance		
		Initial		1 Week		1 Month		Initial		1 Week		1 Month				
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	p1	p2	p3
Total Score of safe use of walker	Poor Practice Level <50%	29	96.7%	-	0.0%	-	0.0%	30	100.0%	30	100.0%	29	96.7%	χ2=1.02 p1=0.313 ns	χ2=60.0 p2<0.001***	χ2=56.5 p3<0.001***
	Fair Practice Level 50-75%	1	3.3%	5	16.7%	7	23.3%	-	0.0%	-	0.0%	1	3.3%			
	Good Practice Level 75%+	-	0.0%	25	83.3%	23	76.7%	-	0.0%	-	0.0%	-	0.0%			
	Mean ± S.D.	11.17 ± 10.47		55.23 ± 5.72		21.97 ± 2.93		9.40 ± 7.04		10.70 ± 8.00		6.00 ± 3.74		t-test=0.77 (p=0.447 ns)	t-test=24.80 (p<0.001***)	t-test=18.40 (p<0.001***)
	Paired t	t=29.80 p4<0.001***		t=24.27 p5<0.001***		t=2.08 p6=0.047*		t=3.47 p4=0.002**		t=6.62 p5<0.001***		t=6.05 p6<0.001***				

T-test : Student's t test   Paired t: Paired t-test bet. Pre- & Post, χ2: Chi-Square test. p1: p value bet. study & controls Pre-implementation, P2: p value bet. study & controls after 1 Week, P3: p value bet. study & controls after 1 Month, p4: p value bet. Pre- & 1 Week (among each group), p5: p value bet. Pre- & 1 Month (among each group), p6: p value bet. 1 Week & 1 Month (among each group), highly statistically significant at p<0.05, ***:

Table (8): **Comparison between control and studied patients with femur fracture surgeries regarding DVT incidence monitoring post one month of implementation the nursing protocol using Doppler**

DVT incidence monitoring		Studied Group		Control Group		Test of Significance
		No.	%	No.	%	
DVT Lower Limb (Doppler)	Free	29	96.7%	15	50.0%	χ2=16.86 p=<0.001***
	Presence of DVT Right Lower Limb	1	3.3%	9	30.0%	χ2=7.68 p=0.006***
	Presence of DVT Left Lower Limb	-	0.0%	6	20.0%	χ2=6.667 p=0.010***

χ2: Chi-Square test, highly statistically significant at p<0.05, *** p: p value for comparing between the studied groups

References

Ahuja, R. B., Bansal, P., Pradhan, G. S., & Subberwal, M. (2016). An analysis of deep vein thrombosis in burn patients (part II): A randomized and controlled study of thrombo-prophylaxis with low molecular weight heparin. *Burns, 42*(8), 1693-1698. https://doi.org/10.1016/j.burns.2016.08.007.

Azzam, N. (2021). *Factors Associated with Medications Adherence among Patients with Rheumatoid Arthritis* [Master Thesis]. Faculty of Nursing, Alexandria University.

Barfod, K. W., Nielsen, E. G., Olsen, B. H., Vinicoff, P. G., Troelsen, A., & Holmich, P. (2020). Risk of deep vein thrombosis after acute achilles tendon rupture: A secondary analysis of a randomized controlled trial comparing early controlled motion of the ankle versus immobilization. *Orthopaedic Journal of Sports Medicine, 8*(4), 2325967120915909. https://doi.org/10.1177/2325967120915909.

Brown, T., Yeoh, S. E., Pang, D., & Gabbott, B. (2021). Interventions for the primary prevention of venous thromboembolism for hip fracture surgery. *The Cochrane Database of Systematic Reviews, 2021*(10), CD015011. https://doi.org/10.1002/14651858.CD015011.

Campos, J., & Brill, A. (2019). By word of mouse: using animal models in venous thrombosis research. *Platelets, 31*(4), 447-454. https://doi.org/10.1080/09537104.2019.1678117.

Farag, A., Eweda, S. M., & Elsayed, N. F. (2017). Nurses knowledge and practice in dealing with high alert medications. *Alexandria Scientific Nursing Journal, 19*(2), 1-24.

https://doi.org/10.21608/asalexu.2017.208348.

Fischer, C. R., Wang, E., Steinmetz, L., Vasquez-Montes, D., Buckland, A., Bendo, J., Frempong-Boadu, A., & Errico, T. (2020). Prevalence of Risk Factors for Hospital-Acquired Venous Thromboembolism in Neurosurgery and Orthopedic Spine Surgery Patients. *International Journal of Spine Surgery, 14*(1), 79-86. https://doi.org/10.14444/7011.

Flevas, D. A., Megaloikonomos, P. D., Dimopoulos, L., Mitsiokapa, E., Koulouvaris, P., & Mavrogenis, A. F. (2018). Thromboembolism prophylaxis in orthopaedics: an update. *EFORT Open Reviews, 3*(4), 136-148. https://doi.org/10.1302/2058-5241.3.170018.

Forgo, G., Micieli, E., Ageno, W., Castellucci, L. A., Cesarman-Maus, G., Ddungu, H., De Paula, E. V., Dumantepe, M., Guillermo Esposito, M. C., & Konstantinides, S. V. (2022). An update on the global use of risk assessment models and thromboprophylaxis in hospitalized patients with medical illnesses from the World Thrombosis Day steering committee: Systematic review and meta-analysis. *Journal of Thrombosis and Haemostasis, 20*(2), 409-421. https://doi.org/10.1111/jth.15607.

Fuji, T. (2016). Anticoagulant therapy for venous thromboembolism prophylaxis in orthopaedic surgery in Japan: The evolving role of NOACs. *Current Orthopaedic Practice, 27*(6), 666-672. https://doi.org/10.1097/BCO.0000000000000043.

Garrison, M. (2019). *Educational Program for RNs Related to the Use and Function Mechanical Prophylaxis in VTE Prevention.* from

https://stti.confex.com/stti/lc18/web program/Paper93093.html

González-Mares, M. O., Aradillas-García, C., Márquez-Mireles, L. E., Monsiváis-Nava, C. D., Bernal-Medina, J. E., Vargas-Morales, J. M., Portales-Pérez, D. P., & Cubillas-Tejeda, A. C. (2022). Implementation and evaluation of an educational intervention to prevent risk factors for the development of non-communicable diseases in Mexican families of suburban communities. *Evaluation and Program Planning, 92*, 102075. https://doi.org/10.1016/j.evalprogplan.2022.102075.

Gromadziński, L., Paukszto, Ł., Lepiarczyk, E., Skowrońska, A., Lipka, A., Makowczenko, K. G., Łopieńska-Biernat, E., Jastrzębski, J. P., Holak, P., Smoliński, M., & Majewska, M. (2023). Pulmonary artery embolism: comprehensive transcriptomic analysis in understanding the pathogenic mechanisms of the disease. *BMC Genomics, 24*(1), 10. https://doi.org/10.1186/s12864-023-09110-0.

Jiang, L., Chen, E., Huang, L., & Wang, C. (2021). Arthroscopy-assisted reduction percutaneous internal fixation versus open reduction internal fixation for tibial plateau fracture: a systematic review and meta-analysis. *Orthopaedic Journal of Sports Medicine, 9*(12), 23259671211027838. https://doi.org/10.1177/23259671211027838.

Jock, A. M. (2020). Samuel Johnson's view about Oduduwa in connection with the origins of the Yoruba. *HTS Teologiese Studies/Theological Studies, 76*(4), a6013. https://doi.org/10.4102/hts.v76i4.6013.

Khalil, E. (2021). *Nurses' knowledge and practices regarding prevention of venous thromboembolism among patients undergoing post major orthopedic surgery patients* [Master Thesis], Faculty of Nursing, Alexandira University.

Kiliç, H. S., Pazar, B., İbrahimoğlu, Ö., & Naldan, M. E. (2023). Quality of care perceived by patients during cystoscopy and affecting factors. *Medicine, 102*(50), e36314. https://doi.org/10.1097/MD.0000000000036314.

Kılıç, M., Köseoğlu, E., Tekkalan, F., Costantini, E., Trama, F., Illiano, E., & Tarcan, T. (2022). Effects of COVID-19 lockdown on people's sexual lives in turkiye. *Journal of Urological Surgery, 9*(4), 281-287. https://doi.org/10.4274/jus.galenos.2022.2022.0034.

Lavall, K. A., & Costello, J. F. (2015). Assessment of the public's knowledge of venous thromboembolism. *Journal of Vascular Nursing, 33*(2), 68-71. https://doi.org/10.1016/j.jvn.2014.11.001.

Lim, C. S., & Davies, A. H. (2014). Graduated compression stockings. *Canadian Medical Association Journal, 186*(10), E391-398. https://doi.org/10.1503/cmaj.131281.

Lin, G., Yang, D., & Sui, W. (2022). [Retracted] Clinical effect of open reduction and internal fixation for femoral neck fracture in young adults and related factors of femoral head necrosis. *Journal of Environmental and Public Health, 2022*(1), 2974830. https://doi.org/10.1155/2022/2974830.

Makedonov, I., Kahn, S. R., & Galanaud, J.-P. (2020). Prevention and management of the post-thrombotic syndrome. *Journal of Clinical Medicine, 9*(4), 923. https://doi.org/10.3390/jcm9040923.

McHale, S., Williams, M., O'Mahony, C., & Hockings, M. (2019). Should we use dabigatran or aspirin thromboprophylaxis in total hip and knee arthroplasty? A natural experiment. *Journal of Orthopaedics, 16*(6), 563-568. https://doi.org/ 10.1016/j.jor.2019.05.008.

Mihara, M., Tamaki, Y., Nakura, N., Takayanagi, S., Saito, A., Ochiai, S., & Hirakawa, K. (2020). Clinical efficacy of risk-stratified prophylaxis with low-dose aspirin for the management of symptomatic venous thromboembolism after total hip arthroplasty. *Journal of Orthopaedic Science, 25*(1), 156-160. https://doi.org/ 10.1016/j.jos.2019.02.009.

Monicka, J. (2016). Effectiveness of stop clot package on knowledge and skill regarding prevention of Deep Vein Thrombosis (DVT) among Eunuchs at selected settings, Chennai, 2015 [Ph.D Thesis]. Omayal Achi College of Nursing, Chennai.

Neeman, E., Liu, V., Mishra, P., Thai, K. K., Xu, J., Clancy, H. A., Schlessinger, D., & Liu, R. (2022). Trends and risk factors for venous thromboembolism among hospitalized medical patients. *JAMA Network Open, 5*(11), e2240373. https://doi.org/10.1001/jamanetwork open.2022.40373.

Nimeri, A. A., Gamaleldin, M. M., McKenna, K. L., Turrin, N. P., & Mustafa, B. O. (2017). Reduction of venous thromboembolism in surgical patients using a mandatory risk-scoring system: 5-year follow-up of an American College of Surgeons National Surgical Quality Improvement Program. *Clinical and Applied Thrombosis/Hemostasis, 23*(4), 392-396.

https://doi.org/10.1177/1076029615 614396.

Nowak, M., Mehrholz, D., Barańska-Rybak, W., & Nowicki, R. (2021). Chronic venous disorders – common and yet unknown – a study of public awareness and primary symptoms in a selected group of patients. *Advances in Dermatology and Allergology, 38*(4), 585-589. https://doi.org/ 10.5114/ada.2021.108911.

Park, S., & Jang, I. (2021). Factors affecting medication adherence in patients with mechanical heart valves taking warfarin: the role of knowledge on warfarin, medication belief, depression, and self-efficacy. *International Journal of Environmental Research and Public Health, 18*(10), 5214. https://doi.org/ 10.3390/ijerph18105214

Quinzi, D. A., Ramirez, G., Kaplan, N. B., Myers, T. G., Thirukumaran, C. P., & Ricciardi, B. F. (2021). Early complications and reoperation rates are similar amongst open reduction internal fixation, intramedullary nail, and distal femoral replacement for periprosthetic distal femur fractures: a systematic review and meta-analysis. *Archives of Orthopaedic and Trauma Surgery, 141*(6), 997-1006. https://doi.org/ 10.1007/s00402-021-03866-4.

Serpici, A., & Gürsoy, A. (2018). Nurse-led patient training improves deep vein thrombosis knowledge and self-care practices. *Journal of Vascular Nursing, 36*(2), 53-63.

Shaaban, A. E. (2021). Effect of nursing care protocol on deep vein thrombosis occurrence among critically neurological patients. *Port Said Scientific Journal of Nursing, 8*(1), 206-225.

Shimizu, Y., Kamada, H., Sakane, M., Aikawa, S., Mutsuzaki, H., Tanaka, K., Mishima, H., Kanamori, A., Nishino, T., & Ochiai, N. (2017). A novel exercise device for venous thromboembolism prophylaxis improves venous flow in bed versus ankle movement exercises in healthy volunteers. *Journal of Orthopaedic Surgery, 25*(3), 2309499017739477. https://doi.org/10.1177/2309499017739477.

Soydan, E., Yılmaz, E., & Baydur, H. (2017). Effect of socio-demographic characteristics and clinical findings on the quality of life of patients with chronic venous insufficiency. *Vascular, 25*(4), 382-389. https://doi.org/10.1177/1708538116685945.

Taylor, A. (2018). *Taylor's Clinical Nursing Skills: A Nursing Process Approach* (5th ed.). LWW.

Tran, M.-H., Nguyen, H. H., Mai, Q. K., & Pham, H. T. (2023). Knowledge and medication adherence of oral anticoagulant-taking patients in Vietnam. *Research and Practice in Thrombosis and Haemostasis, 7*(1), 100044. https://doi.org/10.1016/j.rpth.2023.100044.

Volpe, M. S., Guimarães, F. S., & Morais, C. C. A. (2020). Airway clearance techniques for mechanically ventilated patients: Insights for optimization. *Respiratory Care, 65*(8), 1174. https://doi.org/10.4187/respcare.07904.

Wallis, M., & Autar, R. (2001). Deep vein thrombosis: clinical nursing management. *Nurs Stand, 15*(18), 47-54. https://doi.org/10.7748/ns2001.01.15.18.47.c2969.

Weheida, S., Elabasi, E., Wagieh, W., & Mohamed, H. (2021). Safety nursing practices for fall control for patients post internal fixation surgeries of the lower limb. *Egyptian Journal of Health Care, 12*, 1640-1657. https://doi.org/10.21608/ejhc.2021.219049.

Yu-Fen, M., Yuan, X., Chen, Y.-P., Wang, X.-J., Deng, H.-B., He, Y., & Wu, X.-J. (2018). Nurses' objective knowledge regarding venous thromboembolism prophylaxis: A national survey study. *Medicine, 97*(14), e0338. https://doi.org/10.1097/MD.0000000000010338.

Zang, K., Chen, B., Wang, M., Chen, D., Hui, L., Guo, S., Ji, T., & Shang, F. (2020). The effect of early mobilization in critically ill patients: a meta‐analysis. *Nursing in Critical Care, 25*(6), 360-367. https://doi.org/10.1111/nicc.12455.

Zhang, C., & Li, H. (2024). Deep venous thrombosis in Polytrauma patients with Traumatic Brain Injury: development and validation of a predictive model. *Research Square, 1*, 1-14. https://doi.org/10.21203/rs.3.rs-3958430/v1.