Compliance of non-pharmacological preventive practice of venous thromboembolism among Jordanian nurses

Khalid AL-Mugheed, PhD.a,*, Nurhan Bayraktar, PhD,b Abdulqadir J. Nashwan, PhD(c) b,*, Mohammad Al-Bsheish, PhD.c,d, Adi AlSyouf, PhD,b, Mu’taman Jarrar, PhD.c,e

Abstract
Many practices, such as non-pharmacological preventive practices, have demonstrated significant improvement and reduced the venous thromboembolism incidence. This study aims at investigating the compliance with non-pharmacological preventive practice of venous thromboembolism guidelines among Jordanian intensive care and medical and surgical nurses. Descriptive and cross-sectional with the non-participant observational design was used. This study recruited 271 registered nurses in adult medical-surgical units and intensive care units of 12 different government hospitals in Jordan’s middle and north regions. The observational checklist included 10 preventive practices based on the non-pharmacological preventive of venous thromboembolism guidelines. In the observational checklist, the highest score was 20, and the lowest was 0. If the nurse received equal to or higher than (>14) score were classified as sufficient compliance, while insufficient compliance was (≤14) score. The observations period started from September 2019 until March 2020. The participants’ overall mean venous thromboembolism compliance score was insufficient compliance (10.6 ± 1.6). The majority of nurses were classified as insufficient compliance 67%. “Doing foot exercise and early ambulation 2 times per day 50.3%” and “checked the integrity of the patient’s skin at regular intervals 50.0%” were the highest practices done rightly and completely by half of the participants. The participants who had a bachelor of nursing degree, staff nurse, and works in the intensive care unit, are less experienced and have no previous venous thromboembolism education reported low venous thromboembolism compliance. This study presents expanded compliance regarding venous thromboembolism preventive practices among Jordanian intensive care and medical & surgical nurses, so the policymakers need to develop an initiative to improve nurses’ compliance.

Abbreviations: DVT = deep vein thrombosis, VTE = venous thromboembolism, SD = standard deviations.

Keywords: compliance, non-pharmacological prevention, nurse, observational study, prophylaxis, venous thromboembolism

1. Introduction
Venous thromboembolism (VTE) is a complex disease, including deep vein thrombosis (DVT), and pulmonary embolism, and has emerged as the third widespread among thromboembolic diseases, with an annual incidence of more than 10 million people globally.1,2 VTE has been affecting both ambulatory and hospitalized patients and is also known as the “silent killer” of hospitalized patients.3

Although the VTE incidence in Asian countries is lower than in Western countries, this problem has become the main issue in daily clinical practice in the Asian region.1 A recent study revealed that the VTE incidence rate is increasing over time.4

Nine Asian hospitals reported VTE rates ranging from 11 to 88 cases per 10,000 admissions, also Post-surgical DVT was estimated from 0.15 to 1.35%.5 A multinational cross-sectional study conducted among 4983 surgical and medical patients in ten countries in the Middle East region, including Jordan, reported that 1289 patients (26%) had high risk and 1921 patients (38.5%) had a very high risk for VTE.6 In Taiwan, 4.3% of VTE patients died in hospital, 7.5% died within 30 days, and 14.9% died within 6 months.7

The encumbrance of VTE is not restricted to the primary incidence of disease, its sequels by complications such as...
recurrence, chronic thromboembolic pulmonary hypertension, and post-phlebitic syndrome, which lead to a significant increase in mortality, morbidity, prolonged hospitalization, and cost.[9] In the US, the annual VTE cost is estimated $7 to $10 billion, and 375,000 to 425,000 to treat VTE cases newly diagnosed.[9]

VTE is a preventable disease, VTE prophylaxis is considered one of the 10 most important patient safety practices.[10] Several VTE guidelines have been established by organizations in order to decrease VTE mortality and enhance prevention. The pharmacological and non-pharmacological preventive practices recommended in these guidelines include graduated compression stockings, intermittent pneumatic compression, and anti-coagulation therapy.[13,10] The benefits of non-pharmacological preventive practices were shown in different studies.[11,12] In a prospective cohort study among 798 patients, the study showed used intermittent pneumatic compression was associated with lower VTE incidence.[13] However, implementing effectively VTE non-pharmacological prophylaxis may minimize healthcare burden and VTE mortality because pharmacological VTE is associated with workload and cost.[14]

Although physician determines the final decision of VTE treatment, evidence shows that the nurses play a significant role in providing proper VTE prophylaxis, which would reduce the complications and enhance the care of hospitalized patients.[15,16] A study revealed that nurses deliver a daily assessment of DVT prophylaxis better than other health professionals.[17] In another study, mortality and morbidity rates were diminished among the patients with DVT after education by nurses.[18] However, the literature showed nurses have a deficiency of knowledge in terms of VTE. In recent studies conducted in Northern Cyprus, the nurses showed low knowledge scores for VTE risks and prophylaxis.[16,19] In other studies, participants had poor pharmacological and physical prophylaxis knowledge.[15,20] However, no study has focused on VTE compliance toward Jordanian intensive care and medical-surgical unit nurses. This study aimed to investigate VTE guidelines’ compliance with preventive practices among Jordanian intensive care nurses and medical and surgical unit nurses.

2. Research questions

1. Do intensive care and medical & surgical unit nurses have sufficient compliance regarding non-pharmacological preventive practices for VTE guidelines?
2. Which factors affect nurses’ compliance regarding non-pharmacological preventive practices for VTE guidelines?

3. Methods

3.1. Study design

Descriptive and cross-sectional with non-participant observational design was used in the current study.

3.2. Study setting

The study was conducted in adult medical-surgical units and Intensive care units of 12 different government hospitals in Jordan’s middle and north regions (Amman, Irbid, Mafraq, Jerash, and Zarqa). These hospitals receive the highest cases of VTE annually and have the highest number of registered nurses compared with other Jordan cities.

3.3. Participants

The selected sample was stratified based on the number of intensive care and medical & surgical unit nurses in each hospital and the hospital location. The sample size was calculated by G* Power version 3.[21] Based on an estimated power = 0.95, medium effect size 0.12, and a statistical significance 0.05, the required sample size was estimated to be 214. Three hundred nurses were included, of whom only 271 accepted to participate by convenience sampling was used, with a response rate of 79%. Inclusion criteria were registered nurses with at least one year of experience in medical, surgical units, and the intensive care unit. The technicians and registered nurses from other departments were removed.

3.4. Study tool

The study tool is composed of two sections; the first section consisted of participants’ characteristics (gender, academic qualification, position, department, years of experience, and previous education on VTE). The second part of the tool comprised an observational checklist of 10 VTE non-pharmacological preventive practices. The checklist was adopted based on the VTE National Institute for Health and Care Excellence guideline 2020, which focused on VTE non-pharmacological preventive practices.[10] These preventive practices provide trustworthy directives for nurses in the prevention of VTE patients. The major topics covered in the VTE prevention guidelines include foot exercise, early ambulation, accurate measurement size of stockings and fitting of intermittent pneumatic compression.[10] The observational checklist included three options per item: done right and completely was received 2 points, partially done but not rightly and completely 1 point and “not done” no points. In the observational checklist, the highest score was 20, and the lowest was 0. If the nurse received equal to or higher than (>14) score were classified as sufficient compliance, while insufficient compliance was (≤14) score.

A panel of experts, including two nursing professors in the medical surgical nursing file and four nurses working in medical and surgical wards, participated in the initial validation draft of the study tool, encompassing 12 items. To check readability and understandability, the panel recommended improving some items by rewording and removing two items considered outside of nursing responsibilities. After the panel feedback, a pilot test among 15 nurses was conducted for appropriateness and appearance of bias. The observational checklist revealed very good reliability and internal consistency with Cronbach’s α of 0.80. The average interclass correlation coefficient was 0.83 with a 95% confidence interval from 0.78 to 0.88.

3.5. Data collection

After obtaining ethical approval, the principal investigator informed the participants that they would observe, while observing time and observers were not disclosed. The observers were medical-surgical expert nurses who were knowledgeable in VTE preventive practices in their hospitals and worked outside of the participating hospitals. Before the study, the observers underwent a brief training that included VTE non-pharmacological preventive practices, purposes of the study, and how to perform documentation and observations. For each hospital, one observer was allocated.

The total observations period of the nurses was six months during their routine work started from September 2019 until March 2020. The observers chose available nurses who were directly responsible provide care for patients with VTE risk and observed them until the end of the shift, day and night. During the observation, the observers used direct observations at the bedside to measure compliance without participating in their implementation. If the nurse performed the preventive practices consistently and correctly according to the observational checklist from VTE guidelines, the observers recorded “done rightly and completely.” If the nurse performed the preventive practices inconsistently and or missed any steps...
with VTE guidelines, “partially done but not rightly and completely” was recorded. The last option, “not done” was documented when the nurse failed to perform the guideline. One observational checklist was done for each participant, even if the participant provided care of one more patient. At the end of the observation, the practices of the participant were documented on the observational checklist by the observer. The participants who did not accept joining the study were informed that nonparticipation would not jeopardize their work during and after the study. A monthly rotation of the observers between the participating hospitals was made to minimize observer bias.

3.6. Data analysis

Data were analyzed using SPSS version 22 (SPSS Inc., Chicago, IL.). Incorrect parts of the data, or missing < 10% of the study variables was considered missing and excluded from the final analysis. The Kolmogorov–Smirnov normality assessment test was performed to confirm whether the data were normally distributed. Frequencies and percentages were used to analyze the participants' characteristics. VTE compliance scores were calculated by means and standard deviations (SD). The independent sample t-tests were used to discover possible associated factors with VTE compliance practices. The chosen level of significance is $P < .05$.

3.7. Ethical considerations

Ethical approval (89/2019) was obtained from the Ministry of Health in Jordan. In addition, informed consent was obtained from all nurses who participated in the study.

4. Results

Table 1 showed the characteristics of the nurses. The results showed that two-thirds of the nurses were female; most of them had a bachelor of nursing degree, worked as a staff nurse, and worked in a surgical unit. Approximately more than half of the participants have ≤ 5 years of experience (59.1%). Regarding the previous VTE education, 64.5% of them had no previous education. Table 2 showed the VTE compliance of the participants. The overall mean VTE compliance score of the participants was $10.6 \pm 1.6$. The majority of nurses were classified as showing insufficient compliance 67%. The observers noted that half of the participants did rightly and completely regarding items “Doing foot exercise regularly”, “Early ambulation 2 times per day”, and “Regularly moving bedridden patients helps prevent VTE”. On the other hand, approximately less than a quarter of nurses did rightly and completely regarding items “Checked the skin by removing the sleeve 2 times a day”, and “Used intermittent pneumatic compression devices regularly”. “The right way to roll the graduated compression stockings”, “Choosing the accurate measurement size of graduated compression stockings”, and “Check fitting of intermittent pneumatic compression devices regularly”.

Table 3 revealed compression between nurse's compliance and their demographic characteristics. The results showed that female nurses scored higher compliance than male nurses ($M = 9.1, SD = 1.4$). Nurses who had a bachelor of nursing degree, working as a staff nurse with ≤ 5 years’ experience reported a low VTE compliance compared with other groups. Nurses in medical unit reported a higher VTE compliance ($M = 10.2, SD = 1.4$), than surgical unit and intensive care unit.

5. Discussion

Nurses’ sufficient compliance would facilitate the optimal provision of patient care, reduce VTE re-occurrence, and instill positive reinforcement to deliver appropriate care toward VTE patients.$^{13}$ This study is the first observational study conducted in Jordanian intensive care medical-surgical unit nurses working in governmental hospitals to assessed VTE compliance. In particular, VTE preventive practices used an observational design with a non-participant approach.

This study found that the majority of nurses were insufficient compliance; that showed a clear lack of VTE prophylaxis compliance among Jordanian intensive care and medical-surgical unit nurses. These results are in contrast to some relevant studies.$^{15,22}$ Different from previously mentioned studies, nurses showed a positive attitude toward VTE prophylaxis.$^{13,24}$ The insufficient compliance may be related to several reasons, such as inadequate healthcare policies and regulations in Jordan regarding VTE prevention. For example, In Jordan, the implemented the hospital’s VTE institutional guideline was poor.$^{25,26}$ Lack of availability of continuous in-service education. In fact, 35.5% only of nurses had received previous VTE education. However, this result may be associated with the nonstandard implementation of VTE prophylaxis and non-optimal care.

Early mobilization and foot exercise are accepted prophylaxis for VTE patients.$^{27}$ Previous studies showed that foot exercise and early mobilization contributed to increased blood flow velocity.$^{11,12,25}$ In the current study, half of the participants noticed that they did rightly and completely in terms of early mobilization and foot exercise. This result matched with a recent study that found the majority of nurses were encouraged early mobilization and exercise.$^{28}$ In another study found that the majority of nurses had the full possibility to performed foot exercises.$^{29}$ On the contrary, the Northern Cyprus study showed that only 14.5% of nurses encouraged patients for early mobilization.$^{19}$ This finding reflects the attempts of nurses to encourage hospitalized patients to perform early mobilization. The possible explanation is that this kind of measure may not require additional resources and efforts.

Mechanical prophylaxis methods, intermittent pneumatic compression, and graduated compression stockings were showed significant improvement for VTE patient’s outcomes.$^{25}$
According to the American College of Chest Physicians, each health care setting should follow effective strategy guidelines for VTE prevention. Applying mechanical prophylaxis correctly is a prerequisite for their function; otherwise, using mechanical prophylaxis improperly might lead to negative care outcomes. The observations demonstrated that almost a quarter only of nurses were done rightly and completely toward mechanical prophylaxis measures. This result is consistent with the study Al-Mugheed, and Bayraktar reported that only 8.5% of nurses used graduated compression stockings. In another study, most nurses were not sure regarding VTE mechanical prophylaxis compliance increased following education toward nurses in order to improve nurses' VTE compliance. Moreover, the nurse’s compliance should be frequently evaluated.

The low level of education, staff nurses, and low years of experience participant’s reported low VTE compliance with statistical significance, the findings were consistent with. It can be attributed that nurses gained their knowledge practice from normal clinical works without supervision, and most nurses do not spend more effort to improve their VTE knowledge practice such as self-study, workshop, and congress. Moreover, nurses may have lacked confidence while applying mechanical prophylaxis because of a lack of supervision and resources.

In the present study, intensive care unit nurses showed low VTE compliance score than other departments, which none agreed with several studies showed that intensive care unit nurses gained in terms of VTE prophylaxis, which can be attributed to the fact that intensive care unit faced severe workloads and emotional stress and needs to take serious and rapid decisions about patients’ lives. Keeping attention to the nurses’ workload is of the utmost importance to keep patients’ safe and enhance outcomes.

There was statistical significance with mean VTE compliance and previous VTE education. The nurses who had previous VTE education reported higher compliance than others, who agreed. In the pretest/posttest study conducted in Sydney, Australia, of medical/surgical nurses, the results showed that the education supported them in applying VTE mechanical prophylaxis. In quasi-experimental and intervention design, nurses in the intervention group had a higher VTE compliance rate than the control group at the postoperative phase. The authors conclude that adherence to prophylaxis increases when the hospitals provide continuous VTE education. In another study, VTE prophylaxis compliance increased dramatically from 27% to 85% over 5 years in metropolitan Australian hospitals as a result of evidence-based education sessions. In another study, VTE prophylaxis compliance increased following education toward rural nurses. However, we believe that ongoing VTE education programs are still essential to their primary duty in VTE prevention, and institutions and departmental managers should keep their attention for nurses’ training.

6. Limitations
Care of patients is a multidisciplinary task, and in this study, only nurses were observed; future studies are encouraged to involve other health care providers, given the high variability that monitoring the thromboprophylaxis was not their daily task. Comprehensive educational programs and campaigns based on well-established and standardized tools should be addressed toward nurses in order to improve nurses’ VTE compliance. Moreover, the nurse’s compliance should be frequently evaluated.

Table 2
Comparison of total mean venous thromboembolism prophylaxis compliance and characteristics of the nurses.

| Characteristics of the nurses | Mean (SD) | t  | P  |
|-------------------------------|----------|----|----|
| Gender                        |          |    |    |
| Female                        | 9.1 ± 1.4| 1.6| .09|
| Male                          | 8.4 ± 1.1|    |    |
| Academic qualification        |          |    |    |
| Bachelor                      | 8.8 ± 2.2| 2.4| .03|
| Master                        | 10.9 ± 2.4| | |
| Position in department        |          |    |    |
| Staff nurse                   | 9.5 ± 1.8| 0.27| .01|
| Senior nurse                  | 10.8 ± 2.9| | |
| Department                    |          |    |    |
| Medical                       | 10.2 ± 1.4| 1.3| .00|
| Surgical                      | 9.7 ± 2.3|    |    |
| Intensive care unit           | 8.1 ± 3.4|    |    |
| Years of experience           |          |    |    |
| ≤5 years                      | 8.4 ± 4.1| 0.18| .00|
| >5 years                      | 11.3 ± 3.7| | |
| Previous venous thromboembolism education | 11.4 ± 4.1| 0.12| .01|
| Yes                           | 10.4 ± 3.8| | |
| No                            |          |    |    |

SD = standard deviation.

Table 3
Comparison of total mean venous thromboembolism prophylaxis guidelines (N = 271).

| Venous thromboembolism guidelines items | Done rightly and completely | Done but not rightly and completely | Not done |
|----------------------------------------|-----------------------------|------------------------------------|---------|
|                                        | N  | %  | N  | %  | N  | %  |
| Doing foot exercise regularly.         | 144| 50.3| 100 | 38.9| 27 | 10.8|
| Early ambulation 2 times per day.      | 134| 50.6| 91  | 35.1| 46 | 14.3|
| Regularly moving bedridden patients.   | 115| 50.0| 85  | 35.0| 30 | 15.0|
| Remove the sleeve about 30 min to check the skin (2 times a day). | 64 | 24.1| 108 | 39.1| 99 | 36.8|
| Daily assessment of the graduated compression stockings. | 70 | 24.0| 113 | 41.9| 88 | 34.1|
| Used intermittent pneumatic compression devices 24 hours for bedridden patients. | 77 | 21.9| 129 | 61.2| 65 | 16.9|
| Graduated compression stockings should not be worn folded. | 77 | 26.2| 92  | 33.7| 102| 40.1|
| Use right way to roll the graduated compression stockings. | 74 | 29.2| 105 | 37.3| 92 | 33.5|
| Choosing the accurate measurement size of graduated compression stockings | 74 | 28.1| 112 | 39.8| 85 | 32.1|
| Check fitting of intermittent pneumatic compression devices regularly. | 67 | 27.1| 122 | 40.1| 82 | 32.8|

Done but not rightly and completely, Done but not rightly and completely.
in professional aspects among various institutions. In order to reduce bias and the Hawthorne effect that observer may create, using cameras to record nurses during patient care are recommended. The limitation of this study regarding study setting, the nurse’s inclusion were from one country, indicates difficult generalizability of the findings. Second, the observational checklist included only practices related to non-pharmacological preventive practice of VTE. Furthermore, the in-depth assessment of compliance with the pharmacological preventive practice was not available. Further study should focus on a series of barriers that face nurses to implementing VTE guidelines.

7. Conclusions
This study is the first observational study to investigating the compliance with non-pharmacological preventive practice of VTE guidelines among Jordanian intensive care and medical-surgical unit’s nurses. Results showed that most nurses were insufficient compliance with preventive non-pharmacological preventive practice of VTE guidelines. Also, the current study results showed a necessity for focused and productive VTE teaching sessions in Jordanian hospitals. For this reason, the policymaker may need to develop an initiative in order to increase nurse compliance, such as appointing VTE clinical nurse consultant; the main responsibility of this nurse is maintaining the VTE program, educated in VTE prophylaxis and risk assessment, and observing clinical practice for new staff, and inexperience.

Author contributions
All authors read and approved the final manuscript.
Conceptualization: Khalid AL-Mugheed.
Data curation: Khalid AL-Mugheed, Nurhan Bayraktar, Abdulqadir J. Nashwan, Mohammad Al-Bsheish, Adi AlSyouf, Mu’taman Jarrar.
Formal analysis: Khalid AL-Mugheed.
Methodology: Khalid AL-Mugheed, Nurhan Bayraktar, Abdulqadir J. Nashwan, Mohammad Al-Bsheish, Adi Al-Syouf, Mu’taman Jarrar.
Writing – original draft: Khalid AL-Mugheed, Nurhan Bayraktar, Abdulqadir J. Nashwan, Mohammad Al-Bsheish, Adi Al-Syouf, Mu’taman Jarrar.
Writing – review & editing: Khalid AL-Mugheed, Nurhan Bayraktar, Abdulqadir J. Nashwan, Mohammad Al-Bsheish, Adi Al-Syouf, Mu’taman Jarrar.

Corrections
Affiliation e has been changed from “Department of Managing Health Services and Hospitals, Faculty of Business Rabigh, College of Busi-ness (COB), King Abdulaziz University, Jeddah, Saudi Arabia,” to “Medical Education Department, King Fahd Hospital of the University, Al-Khobar 34445, Saudi Arabia.” Affiliation f has been changed from “Vice Deanship for Quality and Development, College of Medicine, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia” to “Vice Deanship for Development and Community Partnership, College of Medicine, Imam Abdulrahman Bin Faisal University, Dammam 34212, Saudi Arabia.”

References
[1] Yamashita Y, Morimoto T, Yoshikawa Y, et al. Temporal trends in the practice pattern for venous thromboembolism in Japan: insight from JROAD-DPC. J Am Heart Assoc. 2020;9:014582.
[2] Key NS, Khorana AA, Kuderer NM, et al. Venous thromboembolism prophylaxis and treatment in patients with cancer: ASCO clinical practice guideline update. J Clin Oncol. 2020;38:496–520.
[3] Centers for Disease Control and Prevention. 2016. Venous thromboembolism (Blood Clots). Available at: http://www.cdc.gov/nchdddv/dvt/facts.html [access date June 9, 2018].
[4] Wu PK, Chen CF, Chung LH, et al. Population-based epidemiology of postoperative venous thromboembolism in Taiwanese patients receiving hip or knee arthroplasty without pharmacological thromboprophylaxis. Thromb Res. 2014;133:719–24.
[5] Lee LH, Gallus A, Jindal R, et al. Incidence of venous thromboembolism in Asian populations: a systematic review. Thromb Haemost. 2017;117:2243–50.
[6] Mokhtari M, Salameh P, Kouchek M, et al. The AVAIL ME Extension: a multinational Middle Eastern survey of venous thromboembolism risk and prophylaxis. J Thromb Haemost. 2011;9:1340–9.
[7] Lee CH, Lin LJ, Cheng CL, et al. Incidence and cumulative recurrence rates of venous thromboembolism in the Taiwanese population. J Thromb Haemost. 2010;8:1515–23.
[8] Kafeza M, Shalhoub J, Salooja N, et al. A systematic review of clinical prediction scores for deep vein thrombosis. Phlebology, 2016;32:516–51.
[9] Scott D, Nelson RE, Nyarko KA, et al. The economic burden of incident venous thromboembolism in the United States: a review of estimated attributable healthcare costs. Thromb Res. 2016;137:3–10.
[10] National Institute for Health and Care Excellence. Venous thromboembolic diseases: diagnosis, management and thrombophilia testing. Available at: www.nice.org.ukguidance/NG158 [access date June 27, 2012].
[11] Hanson E, Corbett K. Non-pharmacological interventions for the prevention of venous thromboembolism: a literature review. Nurs Stand. 2016;31:48–57.
[12] Mandavia R, Shalhoub J, Head K, et al. The additional benefit of graduated compression stockings to pharmacologic prophylaxis in the prevention of venous thromboembolism in surgical inpatients. J Vasc Surg. 2015;3:447–55.
[13] Arabi YM, Khedr M, Dara SI, et al. Use of intermittent pneumatic compression and not graduated compression stockings is associated with lower incident VTE in critically ill patients: a multiple propensity scores adjusted analysis. Chest. 2013;144:152–9.
[14] Nicolaides A, Hull RD, Enooed J, et al. Cost-effectiveness of prevention and treatment of VTE. Clin Appl Thromb Hemost. 2013;19:220–3.
[15] M Yu, Xu Y, Ya-P C, et al. Nurses’ objective knowledge regarding venous thromboembolism prophylaxis: a national survey study. Medicine. 2018;57:0338.
[16] Shah SS, Ahdii A, Ozcem B, et al. The rational use of thromboprophylaxis therapy in hospitalized patients and the perspectives of health care providers in Northern Cyprus. PLoS One. 2020;15:e0235495.
[17] Lloyd NS, Douketis JD, Cheng J, et al. Barriers and potential solutions toward optimal prophylaxis against deep vein thrombosis for hospitalized medical patients: a survey of healthcare professionals. J Hosp Med. 2012;7:28–34.
[18] Lavall KA, Costello JE. Assessment of the public’s knowledge of venous thromboembolism. J Nurs Pract. 2015;33:68–71.
[19] AL-Mugheed K, Bayraktar N. Knowledge and practices of nurses on deep vein thrombosis risks and prophylaxis: a descriptive cross sectional study. J Nurs Pract. 2018;36:71–80.
[20] Xu Y, Wang W, Zhao J, et al. Knowledge, attitude, and practice of healthcare professionals toward clinically applying graduated compression stockings: results of a Chinese web-based survey. J Thromb Thrombolysis. 2019;47:102–8.
[21] Efferdahl E, Faul F, Buchner A. GPOWER: a general power analysis program. Behav Res Methods. 1996;28:1–11.
[22] Ahmed MH, Ghahm HM, Khalil SS. Assessment of Nurses’ Knowledge and Practice about Venous Thrombo Embolism for Cancer Surgery Patients. Assiut Stud J. 2020;8:13.
[23] Yan T, He W, Hang C, et al. Nurses’ knowledge, attitudes, and behaviors toward venous thromboembolism prophylaxis: how to do better. Vascular. 2020;29:1–7.
[24] Lee JA, Grochow D, Drake D, et al. Evaluation of hospital nurses’ perceived knowledge and practices of venous thromboembolism assessment and prevention. J Vasc Nurs. 2014;32:18–24.
[25] Alsous-Younes A, Gharibeh L, Younes N. Evaluation of venous thromboembolism prophylaxis after the introduction of an institutional guideline: extent of application and implementation of its recommendations. J Vasc Nurs. 2015;33:72–8.
[26] Jarab AS, Al-Azzam S, Badaneh R, et al. Awareness and perception of thromboembolism and thromboprophylaxis among hospitalized patients in Jordan. Cureus. 2020;12:18–20.
[27] Chatsis V, Visintini S. Early Mobilization for Patients with Venous Thromboembolism: A Review of Clinical Effectiveness and Guidelines. Ottawa, CD: CADTH; 2018.
[28] Silva JS, Lee J, Grisante DL, et al. Nurses’ knowledge, risk assessment, and self-efficacy regarding venous thromboembolism. Acta Paul Enferm 2020;33.

[29] Songwathana P, Promlek K, Naka K. Evaluation of a clinical nursing practice guideline for preventing deep vein thrombosis in critically ill trauma patients. Aust Emerg Nurs J. 2011;14:232–9.

[30] Geerts WH, Pineo GF, Heit JA, et al. Prevention of venous thromboembolism: the seventh ACCP conference on antithrombotic and thrombolytic therapy. Chest. 2004;126:338S–400S.

[31] Oh H, Boo S, Lee J. Clinical nurses’ knowledge and practice of venous thromboembolism risk assessment and prevention in South Korea: a cross-sectional survey. J Clin Nurs. 2017;26:427–35.

[32] Al-Mugheed K, Bayraktar N. Patient safety attitudes among critical care nurses: a case study in North Cyprus. Int J Health Plann Manage. 2020;35:910–21.

[33] AL-Mugheed K, Bayraktar N, Al-Bsheish M, et al. Patient safety attitudes among doctors and nurses: associations with workload, adverse events, experience. Healthcare. 2022;10:631.

[34] Gaston S, White S. Venous thromboembolism (VTE) risk assessment: rural nurses’ knowledge and use in a rural acute care hospital. Int J Nurs Pract. 2013;19:60–4.

[35] Kim W, Francesca I, Elizabeth M. Testing the effect of a targeted intervention on nurses’ compliance with “best practice” mechanical venous thromboembolism prevention. J Vasc Nurs. 2010;28:92–6.

[36] Lockwood R, Kable A, Hunter S. Evaluation of a nurse-led intervention to improve adherence to recommended guidelines for prevention of venous thromboembolism for hip and knee arthroplasty patients: a quasi-experimental study. J Clin Nurs. 2018;27:e1048–60.

[37] Al-Mugheed K, Bayraktar N. Effectiveness of a venous thromboembolism course using flipped classroom with nursing students: a randomized controlled trial. Nurs Forum. 2021;56:623–29.

[38] Al-Mugheed K, Bayraktar N. Effectiveness of flipped classroom among nursing students on venous thromboembolism (VTE). Niger J Clin Pract. 2021;24:1463–70.

[39] Collins R, MacLellan L, Gibbs H, et al. Venous thromboembolism prophylaxis: the role of the nurse in changing practice and saving lives. Aust J Adv Nurs. 2010;27:83–9.