

Practical Experiences and Challenges for Nurses in the Prevention of Postoperative Venous Thromboembolism in Gynaecological Cancer Patients Based on the Ottawa Model of Research Use: A Qualitative Study

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Abstract: Background: The incident rate of postoperative VTE in gynaecological cancer patients is high. However, taking appropriate prevention and treatment measures can reduce the incidence of VTE in gynaecological patients and improve the prognosis of surgical patients. The Ottawa Model of Research Use (OMRU) provides a comprehensive framework and theoretical guidance for the application of research results and the promotion of practical change. This model is highly suitable as the foundation for VTE prevention decision-making. Previous studies have not explored the prevention of postoperative VTE in gynaecological cancer patients from the perspective of OMRU. **Design:** A qualitative descriptive design was used. Data were collected from nurses (n = 17) and doctors (n = 2) in the gynaecological oncology departments of two tertiary comprehensive hospitals. The data were analysed using content analysis, and the reporting follows a qualitative research checklist (COREQ). **Results:** This study conducted interviews with 19 medical staff members in gynecological oncology departments to identify factors influencing the implementation of VTE prevention measures. at the organizational level, The identified facilitating factors include: a heightened awareness of VTE prevention, a strong sense of responsibility among medical staff, personal experiences, departmental supervision, departmental training, management support and communication, quality control and oversight, assessment indicators, training management, incentive measures, and social benefits. At the patient level, facilitating factors include patient preferences, the impact of medical education, and the roles of both patients and their family members. Conversely, at the organizational level, hindering factors include insufficient promotion of preventive measures, a diminished sense of personal value among medical staff, and increased workload. At the patient level, hindering factors include low levels of attention from patients and their families, inadequate patient self-experience, the influence of disease-related factors, negative impacts on patients, and economic burdens. Finally, at the systemic level, there exist intricate challenges pertaining to the optimization of medical record systems and the management of mechanical prevention equipment for VTE. Uncontrollable factors primarily encompass reimbursement policies for VTE prevention initiatives, the expansion of community healthcare services, and the presence of multiple manufacturers of VTE mechanical prevention devices. **Conclusions:** It is essential to optimize and validate VTE prevention measures implemented by nursing staff is essential. Future efforts should focus on developing a postoperative VTE prevention and care plan for gynecological cancer patients grounded in evidence-based practice to improve patient outcomes. **Aims and objectives:** To describe the practical experience of venous thromboembolism (VTE) prevention among gynaecological tumour nursing staff and summarize the influencing factors of VTE prevention measures, including both promotion factors and hindering factors.

Keywords: Venous thromboembolism prevention; Gynaecological tumour patients; Experiences; Interviews; Nurses

1 Introduction

Venous thromboembolism (VTE) refers to the abnormal clotting of blood in the vein, which completely or incompletely blocks blood vessels (Xu et al., 2023). Pulmonary embolism (PE) and deep ve-

nous thrombosis (DVT) are the two clinical presentation forms of VTE (Haga et al., 2014; Bertoletti et al., 2013). Due to various factors, including the distinct anatomical characteristics related to gynaecological diseases, the nature of open surgical interventions, the presence of malignant tumours, the application of lap-

aroscopic techniques, and the administration of hormonal therapies, the risk of venous thromboembolism (VTE) in patients diagnosed with malignant gynaecological tumours is the second highest among cancer types (Ratib et al., 2016; Zhao et al., 2025). Furthermore, patients affected by gynaecological malignancies, especially in advanced stages, are likely to suffer from bleeding sequelae because of the nature of the tumour itself, an issue that can complicate the management of VTE prophylaxis (Romano et al., 2022).

Accordingly, it is important to initiate active and systematic prevention and intervention measures after surgery to ensure improved patient outcomes that negate the risk of VTE (Yi et al., 2022). Health care organizations have established clinical guidelines for the assessment and prevention of VTE risk (Abukhalil et al., 2022). Guidelines for the prevention of venous thromboembolism (VTE) encompass an assessment of VTE risk, an evaluation of bleeding risk, and clinical decision-making regarding prophylactic interventions, which are informed by the integrated analysis of both VTE and bleeding risk factors (Abboud et al., 2022). For example, guidelines are available to help stratify patients into low, moderate, or high risk categories for VTE and provide corresponding prophylactic measures (Borab et al., 2017). While guidelines for VTE prophylaxis in the Western population are well established, prophylaxis for VTE in Asian countries has not been routinely performed (Heo et al., 2021). Despite the development of numerous guidelines for venous thromboembolism (VTE) prophylaxis, recent clinical studies indicate that appropriate prophylactic measures are frequently underutilized in hospitalized patients (Karajizadeh et al., 2022; Amin et al., 2010). Moreover, doctors and nurses may not be aware of the risk of VTE, which in turn leads to a lack of adherence to clinical practice guidelines for patients with VTE given the complex clinical setting (Jin et al., 2023; Rognoni et al., 2021).

Although VTE prevention is recommended for patients with VTE risk factors, there are conflicting findings concerning whether prophylaxis prevents VTE events in lower-risk patients current studies suggest that most patients with VTE events are severely ill and develop VTE despite receiving a prophylaxis (Michtalik et al., 2015). Nonetheless, nurses play a crucial role in the implementation of VTE prophylaxis guidelines into clinical practice (Al-Mugheed et al.,

2023), several studies have reported that many hospitalized patients do not receive VTE preventive prophylaxis in an appropriate manner, thereby impacting patient safety and lives. Additionally, the literature highlights several hindering factors nurses face in following VTE prophylaxis guidelines, hindering factors (Al-Mugheed et al., 2023; Al-Mugheed & Bayraktar, 2018), including knowledge gaps and patient preference variations (Lau et al., 2021; Streiff et al., 2016). Overall, educating nurses has been shown to reduce VTE prophylaxis administration frequency (Lau et al., 2017). Nurses with better DVT prevention knowledge are 1.75 times more likely to practice effectively (Yohannes et al., 2022). Studies in northern Cyprus and north China reveal inadequate training and knowledge among nurses and ICU medical staff, respectively, affecting VTE prophylaxis standardization (Tang et al., 2015). Our survey revealed that medical staff had limited knowledge of VTE prophylaxis, particularly nurses, while attitudes were generally positive. However, the rate of affirmative responses about practices was low, notably among clinicians (Feng et al., 2021).

The prevention and recognition of VTE are of significant interest, especially in patients with severe illness (Heinrich et al., 2022). Most studies focus on whether doctors and nurses are aware of the diagnosis and manifestations of VTE, while few studies have investigated patients' understanding of symptoms and prevention of VTE (Fan et al., 2022). There is less guidance about what constitutes low risk, and historically, compliance with VTE prophylaxis has been poor (Rothberg et al., 2010; Moss et al., 2022). The results for compliance with providing prophylaxis confirm reports in the literature, indicating that there is underutilization of chemical VTE prophylaxis, both for clinical patients and surgical patients (Farhat, Gregório, & Carvalho, 2018). In addition, without a clear awareness of VTE, patients exhibit poor prevention compliance (Zhang et al., 2022). Furthermore, patient preference for and drug coverage adherence to therapy have important effects on the ability of an anticoagulant to prevent VTE recurrence (Carrier et al., 2018). However, while, mechanical prophylaxis and aggressive mobilization through physical therapy are important preventive measures for VTE (McDuffie et al., 2022), patients refused to use a VTE prophylaxis device, claiming they "tired" and had no energy (Al-

Mugheed et al., 2023).

Therefore, it is worthwhile to investigate why there is a gap between research and practice and how to minimize that gap. The Ottawa Model of Research Use (OMRU) was proposed by the scholars Logan and Graham from the University of Ottawa in Canada in 1998 (Logan & Graham, 1998) and was updated in 2004 (Graham & Logan, 2004). The OMRU provides a template to assess hindering factors and supports for implementing change and to facilitate the selection of intervention strategies with the best probability of success (Gifford et al., 2008). OMRU focuses on evidence-based changes, like nursing continuity, targeting behavior or practice modifications among adopters. It considers practical settings, implements interventions to translate evidence into practice, and evaluates the outcomes on patient health, employee issues, and economic impacts. This model is versatile, applicable to individual professionals, teams, organizations, and healthcare systems. It emphasizes evaluating and monitoring each stage of change—pre, mid, and post (Graham & Logan, 2004). This study focuses on the first phase of OMRU, evaluating obstacles related to evidence change, potential adopters, and the practice environment before applying evidence to clinical practice. The goal is to identify and address potential issues that could hinder adopters during implementation, while also recognizing supportive factors.

2 Methods

2.1 Design

The qualitative descriptive study design is based on naturalistic inquiry philosophy, the goal of which is to recognize the diversity of human communication and shared experiences, as well as the interactive and inseparable nature of these experiences and interactions (Lincoln & Guba, 1985; Bahramirad, Heshmatifar, & Rad, 2020). This approach was chosen due to the research objective of elucidating nurses' experiences with VTE prevention measures in their professional practice. A thorough comprehension of the experiences and perspectives of healthcare professionals, in conjunction with their insights into nurse-patient and doctor-patient relationships as well as healthcare systems, is essential.

2.2 Sample size and implementation

In May 2023, the maximum difference purposive sampling method was used to select gynaecological oncology medical staff from tertiary Grade A comprehensive hospitals as interviewees. The inclusion criteria included the following: doctors and nurses in gynaecological oncology-related departments who have been engaged in clinical work for 2 years or more; medical/nursing managers with intermediate or above professional titles who have been engaged in medical/nursing management work for 10 years or more. The exclusion criteria for this study were participants who terminate their participation prematurely during the interview process. The determination of sample size was based on the principle that interviewee data are saturated and no new topics are emerging.

On the basis of the research objectives, relevant literature was consulted, and after discussion with the research team, an interview outline was developed. Two registered nurses were selected for pre-interviews, and the interview outline was modified on the basis of the interview results. The final interview outline was as follows: ① What VTE prevention measures have you taken in your work? ② Are you willing to provide VTE prevention measures to patients in clinical practice? Why? ③ How effective do you think your VTE prevention measures are? Why? ④ What role do you think patients play in VTE prevention? Why? ⑤ How would you feel as the attending physician/responsible nurse if a patient experienced VTE after surgery? Why?

The interviewer has received training in qualitative research-related courses and has interview experience, thereby ensuring the standardization of the interview process.

2.3 Data collection

In this study, data were collected through face-to-face semi-structured interviews following the interview outline. Before the interview, the opinions of the target interviewee were sought, and an informed consent form was signed once the interviewee agreed to participate. The interview was conducted in a quiet, undisturbed, and relaxed natural environment. Interview techniques such as questioning, retelling, and clarification were used to encourage the interviewees to express their feelings, thoughts, and experiences truthfully and comprehensively. The interview time

was controlled, lasting between 30 and 60 minutes per session, with the average interview being 45 minutes. However, the interview time was appropriately extended according to the actual situation. The recording of the interview content was synchronized, and observations of nonverbal information such as the interviewee's tone, intonation, eye contact, emotions, and body movements were also recorded. Within 24 hours following the interview, each recording was transcribed into a Word document and used for data extraction after double verification for accuracy.

2.4 Data analysis

Template analysis, which differs from other forms of thematic analysis in that it allows an outline template of key areas of interest to guide the analysis, was used to analyse the interview data (Etheridge & Slade, 2017). Based on OMRU theoretical framework, the researchers read and analysed the text content word-for-word according to the structure of the template before transferring it to the corresponding results of the template. During this process, researchers constantly revised the relatively abstract content of the templates. Initially, the researchers engaged in a thorough review of the original materials to develop a comprehensive understanding of the data. Subsequently, they annotated significant concepts identified within the data and proceeded to encode these elements. Following this, the researchers categorized codes with analogous meanings. Finally, they defined and encoded categories, seeking corresponding examples within the textual data. The data organization and analysis were conducted independently by two researchers, who later compared and synthesized their findings. Any discrepancies were deliberated among the research team members until a consensus was achieved. Two researchers independently organized and analysed the data before comparing and summarizing the data. Any differences were discussed among the members of the research team, and consensus was reached.

2.5 Rigour

Semi-structured interview questions were posed to all participants, and the interview guide was followed systematically to ensure rigour during the data collection process and to maintain stability, which is a requisite criterion of reliability in qualitative studies (Long & Johnson, 2000). The first author, who con-

ducted the interviews, worked as a VTE nursing researcher. While the author's background as a nurse caused some bias, considering the differences in the scale of each hospital, this design can still effectively balance the research results. The first author bracketed the bias by using semi-structured interview questions and allowing the interviewee to lead the conversation. Researcher bias was also addressed by a detailed report and the original quotation exemplars from the interviews. Consistency emerged with the data saturation during the interview process (Long & Johnson, 2000). The data were analysed by other researchers, and all the researchers accepted the assumptions. Verbatim quotations were used to support the assumptions as they increase the validation of qualitative research (Long & Johnson, 2000). The research adhered to highly ethical standards, and the importance of the research was evaluated within a social and nursing science context.

3 Findings

3.1 General information

Semi-structured interviews were conducted with 19 medical staff members from gynaecological oncology tumour-related departments on the front line of VTE prevention and management. The interviewees were aged 25-51 years (averaged 33.33 ± 7.28). The number assigned to each interviewee is based on the interview date, as detailed in Table 1.

3.2 Practical experience in postoperative VTE prevention among gynaecological tumour patients

Through in-depth analysis of the interview data, the promoting and hindering factors for postoperative VTE prevention among gynaecological cancer patients were identified on the basis of two aspects: potential adopters (i.e., medical staff) and practical environment of OMRU.

With respect to potential adopters, promoting factors include high awareness of VTE prevention among medical staff, a strong sense of professional responsibility, and deep personal experience and insight. Obstacles or hindering factors include weak expression of personal values among medical staff and increased workload.

With respect to the practical environment, ① at

the organizational management level, promoting factors include performance management, supervision, training, motivation, and education, while obstacles include deficient institutional policies and the insufficient promotion of VTE prevention measures in hospitals and departments. ② At the patient level, the promoting factors are patient preferences, whereas the hindering factors include low patient attention or interest, poor patient self-experience, and the influence of patient disease factors. ③ At the level of social support, promoting factors include the role of patients

and family members, whereas obstacles include lack of interest from family members and negative attitudes from patients. ④ At the level of economic level, the primary issue involves patients' financial burdens. ⑤ An additional hindering factor are certain uncontrollable events, particularly those involving different reimbursement policies for VTE prevention projects, inadequate medical record systems that require optimization, complex management of VTE mechanical prevention equipment, and challenges related to community expansion.

Table 1 Basic information of interviewees in gynaecological oncology-related departments (n = 19)

Number	Age	Professional Title	Position	Academic Qualification
N1	31	Intermediate Nurse	Clinical Nursing Teaching Leader	Master
N2	51	Chief Superintendent Nurse	Chief Nurse	Bachelor
N3	40	Co-chief Superintendent Nurse	VTE Specialist/Chief Nurse	Bachelor
N4	28	Senior Nurse	/	Bachelor
N5	27	Senior Nurse	/	Bachelor
N6	25	Senior Nurse	/	Bachelor
N7	30	Senior Nurse	/	Bachelor
N8	28	Senior Nurse	/	Bachelor
N9	42	Intermediate Nurse	/	Bachelor
N10	33	Senior Nurse	/	Bachelor
N11	29	Senior Nurse	/	Bachelor
N12	37	Intermediate Nurse	/	Bachelor
N13	28	Senior Doctor	/	Master
N14	28	Senior Nurse	/	Bachelor
N15	45	Co-chief Superintendent Nurse	Chief Nurse	Bachelor
N16	39	Co-chief Superintendent Nurse	Chief Nurse	Bachelor
N17	29	Senior Doctor	/	Master
N18	30	Co-chief Doctor	/	Master
N19	38	Chief Superintendent Nurse	Chief Nurse	Doctoral

3.2.1 Potential adopters

3.2.1.1 Factors promoting VTE prevention among frontline medical staff in gynaecological oncology

(1) High awareness of VTE prevention

On the one hand, frontline medical staff in gynaecological oncology had acquired a theoretical understanding of the importance of VTE prevention. *"A literature review concluded that, in the absence of preventive measures, the incidence of venous thromboembolism (VTE) may vary between 10% and 40%. The principle of ankle pump movement is instrumental in promoting blood reflux, and the implementation of ankle pump exercises combined with limb pressure as an intervention, initiated three days prior to surgery, can effectively reduce the rate of thrombosis postopera-*

tively." (Interviewee N11).

On the other hand, frontline medical staff in gynaecological oncology had found that VTE prevention measures effectively reduce the incidence of VTE. In Interviewee N17's ward, the implementation of these measures led to a decrease in VTE cases. Interviewee N15 observed that after treating intermuscular small vein thrombosis, there was almost no recurrence of large vein thrombosis. *"Patients who switched from injectable to oral medication continued their treatment post-discharge, resulting in the disappearance of thrombus in follow-ups. Additionally, patient behavior, such as remaining immobile after surgery, was compared."* (Interviewee N15).

(2) Medical staff members demonstrate a strong sense of professional responsibility

Frontline medical personnel specializing in gynecological oncology approached venous thromboembolism (VTE) prevention with a patient-centered perspective, underscored by a profound sense of professional responsibility. *“Implementing VTE prevention is a crucial responsibility for physicians to ensure patient safety. I am dedicated to promoting these preventive measures, as they are more effective than treating advanced VTE. The benefits to patients are significant, and as healthcare providers, we aim to prevent further health complications. Our goal is for patients to return home safely without issues. A pulmonary embolism poses a serious risk of sudden death.”* (Interviewee N9).

(3) Deep personal experiences and insights

The firsthand experiences of frontline medical staff in gynecological oncology significantly influenced their comprehension of VTE. For instance, one interviewee (N2) shared, *“My 80-year-old mother developed intermuscular vein thrombosis. I stress the importance of ankle pump exercises, which she does only when her leg is swollen, despite my encouragement to continue.”* Another interviewee (N12) recounted, *“After surgery for varicose veins, VTE has worsened my mother’s prognosis, limiting her ability to travel and walk long distances, affecting her quality of life.”* Additionally, a medical professional noted, *“I’ve worn graduated compression stockings for 5-6 years due to my own varicose veins, and though they were initially uncomfortable, they prevent soreness and swelling after a day’s use.”*

3.2.1.2 Hindering factors facing VTE prevention among frontline medical staff in gynaecological oncology

The intrinsic value and workload of medical personnel warranted careful consideration. When the demands of the work do not align with its inherent value and result in an increased workload within an already challenging environment, healthcare professionals may experience adverse emotional responses. As noted by one nurse, *“VTE in patients necessitates extra procedures, increasing workload. Regular checks for equipment issues and pressure levels are essential, involving setup, patient education, inspections, and record-keeping.”* (Interviewee N3).

3.2.2 Practical environment

3.2.2.1 Organizational management

(1) Promotion factors

① Performance

Gynaecological oncology departments could promote the implementation of VTE prevention measures by medical staff. For example, *“the use of VTE mechanical preventive equipment is reflected in the performance salary of nurses, thus indicating that the additional work is being recognized”* (Interviewee N12). *“to demonstrate the value of this additional work, relevant financial incentives should be included for the diagnosis and treatment of VTE and there should be corresponding financial incentives for VTE assessment and intervention measures. Providing such incentives will encourage medical staff to be more willing to engage in VTE prevention and treatment”* (Interviewee N2).

② Supervision

The hierarchical monitoring and determination of core indicators for VTE prevention in hospitals, departments, and individuals are the driving factors for the implementation of VTE prevention measures. Interviewee N1, recognized that *“VTE prevention is issued at the hospital level states that the members of the medical staff attach great importance to it (VTE prevention measures) from top to bottom”*. *“The degree of promotion of VTE prevention measures requires decision-making and support from hospital management; otherwise, it will be difficult to implement such measures on a large scale throughout the hospital”* (Interviewee N3). *“The level of attention given by managers to VTE also depends on the extent of hospital promotion”* (Interviewee N19), according to Interviewee N12, who is currently a third-level supervisor at one of the hospitals participating in the study. *“The hospital has a VTE management team, and the departments have VTE specialists. The target assessment involves the VTE evaluation rate, incidence rate, timely evaluation rate, and intervention rate, which, while required, are difficult indicators to assess”*. Nonetheless, *“At present, the primary statistics centre on the implementation rates of mechanical prevention and drug prevention”*.

③ Training

VTE prevention training was an effective way for medical staff to be involved from the onset of the VTE diagnosis, treatment, and nursing care. Interviewee N3 states, *“We (at the hospital level) have organized large-scale, cyclical in-house specialized training to first raise awareness of VTE among medi-*

cal staff and then gradually carry out specialized training. We (middle-level managers) have received training within the institution or in the form of continuing education courses at the autonomous region or national level.” Interviewee N11 also addressed the need for education and training. “I am the administrator of Corey VTE. I attend hospital training and then communicate it to the department.” “The gap between clinical practice and guidelines for VTE prevention measure may be due to our limited reading of the VTE guidelines. If we want health care professionals to understand and comprehend [how to implement VTE prevention] better, we need to provide training. Training can be conducted in the department, which can benefit everyone in the department and yield better results” (Interviewee N13).

④ Motivation

Multimaterial incentive measures were the catalyst for the implementation of VTE measures. “Our main goal is to encourage frontline personnel to participate in relevant conferences, activities, and competitions, such as hospital star service events, where departments will be listed” (Interviewee N2). Interviewee N12 added, that “incentive measures will give nurses a “stronger sense of honour”, thus encouraging them to implement VTE prevention measures and be more proactive in their actions.” “One potential motivation is patient feedback, sometimes accompanied by hospital-level praise”. Interviewee N1, further stated, “for hospitals, taking good measures to prevent VTE can reduce the occurrence of comorbidities during hospitalization and improve patient satisfaction with the hospital, which can also be considered as a motivation. In terms of social benefits, it saves medical resources” (Interviewee N1).

⑤ Propaganda and education

Medical education could increase patients’ awareness of VTE prevention. Patients should rely on us for education to understand the disease, and they could always understand it by repeating it several times. “Education for patients, it is not enough to only talk at the bedside; sometimes the effect of concentrated learning is also good. “Doctors and nurses working together to educate patients will improve their [the patients] cooperation” (Interviewee N14). “After education, it is necessary to pay attention to the feedback and behaviour of patients and supervise them during inspections. Patients will increase their

frequency of physical activity” (Interviewee N6).

(2) Hindering factors

① At the institutional and policy level

The implementation of VTE prevention measures required corresponding systems and policies. As summarized by Interviewee N3, “While we have indicators to assess VTE prevention measures and some oversight, these indicators are just numbers. Effective implementation requires future action. Much foundational prevention work, like wearing GCS, isn’t reflected in the VTE prevention implementation rate. Although some methods have been highlighted, policy guidance might still be necessary.”

② At the level of hospitals and departments

The hospital’s decisions determined the promotion of measures, e. g., the wearing of a GCS). “We have not promoted the GCS throughout the hospital, and other departments use it less. If a patient needs it, it will be mentioned to them” (Interviewee N2). “We also wear the GCS ourselves and know it works, but we use it less in our hospital. Some patients have heard others say they will wear it themselves when they are admitted, so we do not recommend it” (Interviewee N16).

3.2.2.2 Patient factors

(1) Promotion factors

Patient preferences could actively promote patient-initiated prevention of VTE. Some patients particularly enjoyed performing limb pressure exercises and find them useful, often exceeding the recommended repetitions. “After receiving patient feedback she is willing to administer VTE mechanical preventive measures and feels very comfortable after improving blood circulation” (Interviewee N7). Similarly, “Patients will be very tired after being admitted for examination and returning to the ward. Limb pressure therapy can help patients relax and sleep better at night” (Interviewee N7). “As long as it can benefit the patient’s health, such as wearing a GCS or using a pneumatic pump, the patients who experience it will be very cooperative” (Interviewee N3). “They will have a higher acceptance rate, and they will pay more attention to their postoperative situation” (Interviewee N6).

(2) Hindering factors

① Patient importance

The level of patient attention was an important

factor in VTE prevention education. In clinical practice, *"Some patients may have heard of exercises and measures to prevent lower limb venous thrombosis for the first time, but they [the patients] may think the exercises are not important if they have not heard of them before"* (Interviewee N6). Interviewee N12 agreed, *"Many patients do not do the exercises not because they do not want to do it, but because they do not realize the importance and are therefore indifferent. The patient's initial lack of cooperation is definitely due to a lack of understanding. The joint education of doctors and nurses has the best effect, and patients will pay more attention to it"*.

② Patient's self-experience

The feedback from patients' self-experiences was a noteworthy aspect of the implementation of VTE measures. *"Patients are reluctant to wear GCS due to the skill required and the discomfort from tightness. They often feel uneasy, especially if they're not accustomed to it, and find it particularly uncomfortable in hot weather."* (Interviewee N12). Interviewee N17 echoed the same issues, stating, *"Patients always feel a discomfort when wearing limb pressure sleeves"*.

③ Disease factors

Disease factors were the core consideration in the implementation of VTE prevention. *"Postoperative activity should be carefully evaluated after major surgery, with a focus on whether mobility restrictions are necessary. Minimally invasive surgery encourages patients to get up and move."* (Interviewee N17). Interviewee N16 admits, *"Patients' willingness to follow VTE prevention measures post-surgery depends on their pain levels. They cooperate when pain-free and without symptoms like abdominal pain, bloating, nausea, or vomiting. However, excessive vaginal bleeding or anesthesia reactions reduce their willingness. Some hold outdated beliefs that movement causes pain, so they avoid it to stay pain-free."*

3.2.2.3 Social support

(1) Promotion factors

① The role of family members

The facilitating role of family members could help patients take appropriate preventive measures. Interviewee N14 said that with respect to older patients, family members may need to supervise the implementation of posteducation measures. If family supervision was in place, the patient will do better. Accord-

ing to Interviewee N11, *"Older individuals might initially resist, but with nearby family supervision, they can effectively perform VTE prevention exercises post-surgery. Family members can oversee and provide feedback on the patient's activities"*.

② Patient role

The positive energy exerted by patients could drive their initiative. Interviewee N11 noted that *"people in the same ward can indeed have a promoting effect"*. Similarly, Interviewee N1 found that even in a ward with multiple rooms, *"Patients affect one another; if one patient cooperates with medical staff and moves around after surgery, others will likely do the same, even if they're in pain"*. Nurses sometimes encourage patients who actively cooperate to become ward leaders from whom other patients could learn. *"By establishing typical methods, sometimes the effect can be stronger than simply preaching."* (Interviewee N1). Interviewee N8 also noted, *"When patients listen to their friends talk about the benefits of wearing the GCS, they will believe more and feel that wearing it is good. Even if it is uncomfortable, they will persist. Therefore, the patients still play a certain role"*.

(2) Hindering factors

① The degree of importance attached by family members

Insufficient attention from family members was a limiting factor in the implementation of VTE prevention for patients. For example, Interviewee N18 summed it up well, *"If the family believes an action is pointless, they will advise the patient against it. Strong-willed family members might stop the patient from taking preventive measures, even if the patient wishes to. Some family members focus solely on the disease and think there's no need to worry about VTE unless it occurs, viewing prevention measures as unnecessary."*

② The detrimental influence of patient behavior

Patient behavior significantly hindered VTE prevention efforts; for example, one patient's reluctance to mobilize could trigger similar reluctance in others, creating a chain reaction. As noted by Interviewee N8, *"if one patient refuses limb compression therapy, it can influence others to do the same. Moreover, experiencing side effects or viewing the therapy as ineffective can increase reluctance among patients."*

3.2.2.4 Economic status

Economic burden was a problem that should be comprehensively analysed in the implementation of VTE prevention. If the patient had financial problems treating basic diseases and was required to pay for other medical items, the patient may be unable to accept VTE prevention care. Interviewee N10 encountered many patients who experienced financial difficulties. Hence, even if some patients were informed of the VTE risk, they did not want to spend money as long as VTE has not been diagnosed. *“Some patients with have to pay for medical treatment at their own expense or in other places and thus have financial concerns. Therefore, we choose the simplest and most economical method, such as performing ankle pump exercises, which can also have a preventive effect”* (Interviewee N9).

3.2.2.5 Uncontrollable event

(1) Reimbursement policy

Reimbursement policies influenced patients' choices regarding VTE prevention. Since GCS wasn't covered by medical insurance, some patients were indifferent to wearing it when they have to buy it themselves. As Interviewee N12 pointed out, *“Medical insurance reimbursement ratios vary, leading to differing operation costs for patients, which can cause discomfort and refusal of VTE preventive measures. Regional charging differences exist, and in the DRG era, overall disease costs will be controlled.”*

(2) Medical records system

Differences in medical recorded systems across hospitals lead to variations in VTE prevention. *“Our HIS system now includes a VTE evaluation and tracking form, enabling closed-loop management by nurses. Patient scores and preventive measures are accessible across departments, ensuring continuity.”* Interviewee N12 noted that while their system had a Caprini form for surgical patients, it lacked automatic scoring, and nurse assessments weren't recorded. *“Medical records system has an intelligent warning and evaluation system, which is already an external tool and can provide real-time feedback”* (Interviewee N12).

Medical staff suggested projects to optimize various systems. *“Our medical records system is similar to WORD, requiring manual score entry, which could be improved.”* Interviewee N19 noted that while they use information systems, data capture wasn't ideal.

For instance, information systems could directly record the frequency and duration of limb pressure use, quickly providing preventive effect data to medical staff. This enhanced the reliability of doctor evaluations and nurse development, offering a more convenient and objective metric for clinical research.

(3) Management of VTE mechanical preventive instruments and equipment

The limited availability of VTE mechanical prevention equipment hindered its widespread adoption. *“In the gynecology department, only 1 or 2 devices are available for high-risk patients, who receive treatment for about 20 minutes daily.”* Interviewee N1 noted that this equipment is costly and primarily used for high-risk patients, leaving others without access.

Additionally, the need for trained personnel further restricts its use, as highlighted by Interviewee N12, who pointed out that if each patient requires 16-18 hours of treatment, nurses may struggle to manage other responsibilities. Interviewee N16 noted that *“while bedside ultrasound is user-friendly and eases patient burden, it also places significant pressure on ultrasound technicians, exacerbated by a manpower shortage. Managing VTE mechanical preventive instruments requires careful consideration of various factors, including maintenance safety”*.

Moreover, management now included performance testing of these instruments. Interviewee N3 highlighted that *“limb air pressure pumps require regular pressure maintenance after 7-8 years of use, as older instruments may not maintain original pressure values. Furthermore, ensuring sleeve disinfection is crucial to prevent cross-infection during use.”*

(4) Community expansion

The expansion of VTE service projects in community would promote VTE prevention knowledge among the public. *“VTE prevention can be incorporated into community education programme, and high-risk patients can receive VTE mechanical prevention at community hospitals. For patients, community hospitals can provide reimbursement and prevent diseases”* (Interviewee N12). For community hospital staff, it was also possible to increase their income appropriately. *“Family doctor industry is constantly developing. If family doctors can share patient information within their jurisdiction, whether the patient is hospitalized or not, it will increase their attention to VTE or high-risk groups for VTE and promote the implemen-*

tation of VTE prevention outside the hospital” (Interviewee N2). “The popularization of rapid recovery concept has shortened the treatment and nursing time of patients in hospitals and accelerated the process of patient self-recovery, and for VTE prevention, chronic diseases, long-term bed rest, and elderly patients, there is also a need for extension outside the hospital, such as community attention” (Interviewee N19).

4 Discussion

4.1 Clarifying and promoting the current clinical status and efficiency of VTE prevention measures for gynaecological cancer medical staff

It is the compliance of the nurses to implement the VTE prevention measures that promotes their provision of optimal care to patients and reduces the occurrence of VTE (Khaild et al., 2022). This study examined factors aiding VTE prevention from the viewpoint of gynaecological cancer medical staff. Findings showed that these professionals are highly aware of VTE prevention, possess a strong sense of duty, and have valuable personal insights. Despite their positive attitudes and willingness to implement prevention measures, challenges like weak personal values and workload pressure hinder their efforts, aligning with previous interview findings (Abboud et al., 2022). As a shortage of nursing human resources is a common phenomenon in China (Huang et al., 2019), innovative care systems that utilize alternative human resources are needed to address this service gap (Vanderburg et al., 2022). Moreover, managers should quantify the specific work tasks and professional value of VTE prevention measures, improve performance evaluation standards, and provide incentive value.

4.2 Improving the organizational management of VTE prevention for gynaecological cancer patients and optimizing the standardization of VTE prevention measures

The promotion of VTE prevention measures requires sound organizational management. Accordingly, medical institutions should establish a VTE prevention and control system within the hospital; establish a VTE management team composed of functional departments such as medical, nursing, quality manage-

ment, and clinical departments; develop a scientific VTE prevention and control management path; and conduct standardized VTE risk assessments and prevention protocols (Zhejiang Provincial Alliance for Prevention and Treatment of Pulmonary Embolism and Deep Vein Thrombosis, 2023).

In terms of supervision, the interview revealed that the local area follows the three-level supervision of VTE prevention management in accordance with the expert consensus on prevention (Nursing Professional Committee of the International Vascular Union China Branch, 2021).

With respect to training, medical staff and hospital managers could promote the concept of full participation and improve the level of VTE prevention and control (Liu, 2022). The training’s focus dictates its scope. Large-scale sessions aim to familiarize medical staff with VTE, but detailed prevention requires timely feedback and specialized, cyclical training.

Additionally, local medical institutions should enhance their reward and punishment systems, which currently depend on spiritual and honorary incentives. Research indicates that effective systems encourage healthcare workers to implement VTE prevention measures (Feng et al., 2021). Medical staff expressed varied attitudes towards GCS use in promoting VTE measures, indicating that management heavily influences these efforts through a “top-down” approach. This diversity also suggests ongoing updates to VTE prevention measures, bridging the gap between guidelines and practice. Consequently, a standardized VTE prevention plan for gynaecological tumour patients should be developed, along with clear treatment procedures and operational norms for medical institutions.

4.3 Strengthening awareness of VTE prevention among gynaecological cancer patients and their families and providing personalized VTE prevention health education

The implementation of VTE prevention measures is related to the attitudes of patients and their families towards VTE prevention and treatment. From this lens, the participation of patients and their families in nursing management is crucial for improving nursing services (Cadel et al., 2022). Despite awareness of VTE risks, both patients and families often lack knowledge about its severe complications and symptoms. For instance, a Canadian survey re-

vealed that only 6% of patients knew about the risk of blood clots reaching the lungs, and 20% couldn't identify DVT symptoms (Hill & Treasure, 2010). These findings highlight the need for better patient education on VTE risks, encouraging adherence to prevention strategies, and teaching symptom recognition for self-assessment and reporting (Apenteng et al., 2016).

In terms of patient compliance, this study revealed that the patients exhibited good compliance with medication prevention but poor compliance regarding the wearing of the GCS, an issue possibly related to the patient's lack of relevant education (Apenteng et al., 2016). Accordingly, the content of VTE prevention health education should be more comprehensive and should ensure that patients understand the severity of VTE and its multiple impacts (Wang et al., 2022; Paquette et al., 2019). Moreover, there should be a focus on the psychological impact of VTE education on patients. During the education process, medical staff should avoid using "alarmist" language and incorrect metaphors, should fully consider the individual situation of the patients, and should avoid adverse effects (Nicholson et al., 2020; de Wit, 2022). Once a patient develops VTE, education should include effective communication, psychological support methods to overcome the anxiety and fear caused by a VTE diagnosis, and appropriate educational resources (Nicholson et al., 2020). For example, using patient designed educational videos for educational purposes (Baddeley et al., 2021) and providing customized VTE education methods (Genge et al., 2022).

4.4 Expanding the resources for postoperative VTE prevention in gynaecological cancer patients and promoting the intelligence of VTE prevention measures

This interview discusses creating a VTE prevention information platform, focusing on optimizing a hospital's medical records system and implementing critical value pop-up reminders. While previous research highlights that clinical decision support systems can enhance VTE prevention guideline adherence (Jaspers et al., 2021), some studies indicate that alarm fatigue may lead medical staff to ignore alerts (Wan et al., 2020). Thus, a thorough analysis of information technology platforms is essential, and future research should further investigate this area (Kahn et al., 2019).

Raising public awareness of VTE is crucial for implementing prevention measures in hospitals. As noted in an interview, many patients are unaware of VTE and its risks, highlighting the need for increased public education. A UK survey confirmed this lack of awareness and underscored the importance of informing the public about VTE complications (Boulton et al., 2015). The hospital community family has developed a VTE prevention and control model centered around the hospital, utilizing resource integration, multidisciplinary cooperation, and collaboration with medical consortia and community centers. This model enhances the role of family members in patient care, integrating hospital, community, and family management with self-management for high-risk VTE patients. It establishes a safety monitoring system for early detection and treatment, clarifies the nursing staff's role, improves communication between medical staff and patients, and enhances nursing quality and patient safety. Additionally, incorporating internet technology aids in creating a VTE prevention and control resource within the community (Wu et al., 2020). An information sharing and safety monitoring system that includes the hospital community and the patient family community can provide intelligent services to patients.

4.5 Strengths and limitations

Firstly, this study addresses the high rate of post-operative VTE in gynecological cancer patients by examining nurses' experiences, identifying prevention factors, and proposing solutions. It highlights the need for nurses to enhance preventive measures, improve execution processes, and assess current strategies to refine clinical guidelines. Secondly, guided by the OM-RU model, the study offers a framework for clinical decision-making to improve VTE prevention and translate research into practice. Finally, the data predominantly depends on subjective collection methods, including interviews and observations, which may be susceptible to the influence of the researcher's perspective.

5 Conclusion

Medical personnel exhibit a high level of awareness regarding venous thromboembolism (VTE) prevention, coupled with a strong sense of professional

responsibility and profound personal experiences and insights. Factors like performance management, supervision, training, motivation, and education, along with patient and family involvement, promote successful change implementation and plan development. Conversely, challenges such as diminished staff values, increased workloads, inadequate management policies, insufficient VTE prevention promotion, lack of patient engagement, poor patient experiences, disease impacts, economic burdens, reimbursement issues, inadequate medical records, and complex management of VTE prevention equipment hinder reform success. Therefore, when constructing a plan, it is imperative to address these key considerations and propose viable solutions this is very general and not convincing.

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Ethics approval

This study was approved by the ethics committee of Xinjiang

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Data availability statement

Data available on request due to privacy/ethical restrictions.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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