


ORIGINAL ARTICLE

Chinese orthopaedic nurses' knowledge, attitude and venous thromboembolic prophylactic practices: A multicentric cross-sectional survey

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Funding information

This study has been supported by grant 201502017 from the non-profit professional research and special projects

Abstract

Background: Venous thromboembolism is a severe preventable complication among orthopaedic surgical patients. Integrating therapeutic guidelines into clinical practice can help improve patient safety and reduce the burden of this pathology. Improving the quality of patient care is important for bridging the gap between the prophylaxis for venous thromboembolism and therapeutic guidelines.

Objectives: This study aimed at evaluating the knowledge, attitude, and venous thromboembolism and prophylaxis practices of Chinese orthopaedic nurses to guide quality care improvements.

Methods: The data used in this study are secondary data obtained from a multicentric survey. An anonymous questionnaire was used to measure the attitude and knowledge of venous thromboembolic prophylaxis among orthopaedic nurses. VTE prophylactic practices were extracted from medical records within the electronic case report form immediately after the nurses' investigations. The STROBE statement for observational studies was applied.

Results: Results indicated that although 94.0% of the responding nurses had attended training courses in their wards, a majority of them (68.9%) achieved a median knowledge score of 7 points or below (range 0–9). Knowledge regarding the proper use of prophylaxis, identification of risk factors, signs and symptoms for pulmonary embolism was limited. Self-reported attitudes underestimate the relationships between venous thromboembolism and low-quality nursing care. Pharmacological prophylaxis was highly used (90.9%), while the utilisation of mechanical prophylaxis and its proper use was relatively low.

Conclusions: Chinese orthopaedic nurses demonstrated enthusiasm for venous thromboembolism and prophylaxis. Their knowledge needs to be improved, including the proper use of prophylaxis, identification of risk factors, signs and symptoms.

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of the National Health and Family Planning Commission (Beijing, China)

Mechanical prophylaxis practice for VTE prevention after THA and TKA surgical procedures is not optimistic. Further studies should analyse the causes from multiple perspectives, including the availability of resources, the knowledge and attitude of doctors, nurses and patients.

Relevance to clinical practice: The findings from this study can be used to develop and implement interventions for venous thromboembolism after orthopaedic surgery.

KEYWORDS

prevention, quality improvement, venous thromboembolism

1 | INTRODUCTION

Venous thromboembolism (VTE) is a common pathology among hospitalised patients and is comprised of deep vein thrombosis (DVT) and pulmonary embolism (PE). This condition is the third most common cause of death after ischaemic heart diseases and stroke. In addition, it is the second leading cause of prolonged hospital stays and increased hospital-associated expenses (Di Nisio et al., 2016). The estimated incidence rates of VTE among Caucasians are high. VTE has been estimated to annually occur in approximately 800,000 people across six European countries with a combined population of 300 million people (Cohen et al., 2007). Among the Asian populations, annual VTE incidences are relatively low. The annual VTE incidence in China is 17.5 per 100,000 persons (Zhang, Lei, et al., 2019), 12.6 per 100,000 persons in Japan (Nakamura et al., 2015) and 13.83 per 100,000 persons in South Korea (Yeo et al., 2015). In the Chinese population, VTE incidences have been continuously on the rise, from 3.2 per 100,000 persons in 2007 to 17.5 per 100,000 persons in 2016 (Zhang, Lei, et al., 2019).

Total hip arthroplasty (THA) and total knee arthroplasty (TKA) have been identified as high-risk factors for VTE. Because of the significant trauma associated with artificial joint prosthesis, patients tend to have lower exercise intensities during long-term rehabilitation. This leads to a significant proportion (40%–80%) of patients developing VTE after THA and TKA (Geerts et al., 2008). Furthermore, due to the rising aging population and osteoarthritis incidences, the demand for THA and TKA surgeries are on an upward trajectory. Estimated incidences of osteoarthritis among Chinese people aged over 65 years is as high as 50% (Joint Surgery Group, 2018). End-stage OA, however, is effectively treated by joint replacement surgery. VTE after THA and TKA is associated with prolonged hospital stays, higher hospital costs and increased mortality rates (Shahi et al., 2017). In addition, follow-up data indicate that 9.3% of patients with VTE after THA and TKA progress to the post-thrombotic syndrome that severely affects their quality of life and may cause pain (Zhang, Song, et al., 2019). Therefore, it is necessary to pay attention to VTE prophylaxis after THA and TKA in Chinese population.

2 | BACKGROUND

VTE is preventable (Cohen et al., 2007). Trimodal VTE prophylaxis is a comprehensive modality that encompasses three arms of prophylaxis:

What does this paper contribute to the wider global clinical community?

- This study provides the first comprehensive map of Chinese orthopaedic nurses' knowledge, attitude and venous thromboembolic and prophylactic practices.
- Policies, guideline quality, multidisciplinary collaborations, continuing medical education and patient-centred quality evaluation that were related to the study findings are discussed.
- Therefore, our analysis provides a case, and direction for quality improvements in venous thromboembolism care and prophylactic practices among patients after orthopaedic surgery.

pharmacological, mechanical and general care (early mobilisation, exercising and hydration). This prophylactic modality has been suggested in clinical practice guidelines (CPGs) (American Academy of Orthopaedic Surgeons, 2011; Bang et al., 2014; Falck-Ytter et al., 2012; JCS Joint Working Group, 2011; Liew et al., 2017; National Institute for Health & Clinical Excellence, 2018; Wickham et al., 2012). The availability of CPGs does not, however, translate to implementation and clinical use. It has been shown that a significant proportion of patients do not receive prophylactic care after THA and TKA as recommended in CPGs (Froimson et al., 2009; Chen et al., 2019).

The importance of integrating CPGs into clinical practice to improve patient safety and reduce VTE burden has been established. Nurses are on the frontline in health service delivery and play a central role in translating the CPGs into practice (Collins et al., 2010). Improving the quality of patient care is important for bridging the gap between VTE prophylaxis and CPGs (Lockwood et al., 2018). Practical strategies for improving care should be evidence-based. There is a lack of multicentric data regarding knowledge, attitude and VTE prophylaxis practices (KAP) among Chinese orthopaedic nurses.

3 | METHOD

The reporting of this study was done following the STROBE (STrengthening the Reporting of OBServational studies in

Epidemiology) statement (Appendix S2) (von Elm et al., 2007). Secondary data analysis was used in this study. The data were drawn from the clinical trials, which aimed at determining the effectiveness of a standardised nursing intervention model to prevent major immobility complications among immobile hospitalised patients (Li et al., 2017, 2018; Liu et al., 2019, 2020; Zhu et al., 2020) (Appendix S1). Patients undergoing THA and TKA were among the target populations of the clinical trial. Therefore, the words 'orthopaedics' or 'joint replacement' were used to search and extract the corresponding baseline data from the clinical trial.

3.1 | Sampling strategy

This pre-test/post-test (before and after) trial was performed in 25 hospitals (6 tertiary, 12 secondary and 7 community hospitals) in China. To ensure sample diversity, a convenience sampling method based on bed size and number of nurses per hospital was used to select hospitals. From these hospitals, we recruited participants from neuro-medicine, neuro-surgery, general surgery, general medicine, orthopaedics, geriatric and critical care (intensive care, coronary care or respiratory care) units. Those wards were chosen as investigation sites because of the high proportion of bedridden patients.

Inclusion criteria for nurse participants were as follows: (a) registered professional nurses; (b) currently working in the participating wards; (c) at least 1 year of experience; and (d) understanding the aims of the study and signing the consent form. Nurses were excluded if they were part-time employees, refresher or in-training nurses.

Patients undergoing THA and TKA were among the target populations of the clinical trial. Additional inclusion criteria for patient enrolment were as follows: (a) aged 18 years or older; and (b) understanding the aims of the study and signing the consent form. Patients who were transferred from one ward to another during the investigation period were excluded.

3.2 | Data collection

3.2.1 | Nurses' knowledge and attitude

A self-administered structured questionnaire was developed to collect data from nurses regarding VTE prevention. These data were obtained between September 2015–October 2015 (Appendix S3). The questionnaire consisted of 14 entries in two phases: knowledge (9 items) and attitude (5 items). Correct answers regarding knowledge were given a score of 1, while wrong answers were given a score of 0; the delineating knowledge scores ranged from 0–9. Attitudinal scores were based on a 4-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = agree and 4 = strongly agree).

Development of the questionnaire was based on the Antithrombotic Therapy for VTE Disease: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed guidelines (Kearon et al.,

2012). Content validity of the questionnaires was determined by a panel of five nursing experts (one academic, two nurse managers and two experts in surgical nursing). Item content validity (I-CVI) and scale content validity (S-CVI/UA, universal agreement) were calculated based on expert ratings. After two rounds of expert reviews and modification, the final version of the questionnaire was proven to be reliable and valid with an I-CVI and an S-CVI/UA scores of 1.0 (Lynn, 1986). Internal reliability and stability were determined by Cronbach's α and test-retest reliability, respectively. The Cronbach's alpha score was 0.810, while the test-retest reliability score was 0.875. These scores were considered to be acceptable (Li et al., 2017).

3.2.2 | Nurses' VTE prophylactic practices

The investigation of nurses' VTE prophylactic practices was conducted from November 2015–March 2016. Each hospital appointed a coordinator who was responsible for internal logistics. At least two professionally registered nurses from the same wards being surveyed were appointed to collect patient data using case report forms (CRF). All investigators received training on completing the CRF before the study started to ensure that collected nurses' VTE prophylactic practices and patient data were accurate and reliable. Investigators recorded data daily on a Web-based online CRF. To further ensure data quality, the information recorded by investigators was audited regularly by the head nurse in each ward. Details of the trial design have been reported previously (Li et al., 2018).

Nurses' VTE prophylactic practices and patients' information were collected using CRF, which included patient demographic characteristics (age, gender) and medical information (diagnosis and treatment). Information on patients' underlying diseases was collected from the participating hospitals' medical records departments, using a variant of the International Classification of Diseases, Tenth Revision. DVT were measured according to medical records. A 2-week pilot study was conducted in the clinic to test the applicability and clarity of the CRF, and modifications were made according to suggestions from participating nurses. This showed that the final version of the CRF could be understood clearly and accurately.

3.3 | Ethical considerations

The study protocol was approved by the Human Research Ethics Committee. Nurses were given a covering letter that provided a detailed description of the study. Nurses were informed that they were able to withdraw from the study at any time, and written informed consent was obtained before the study started. Patients received verbal and written information about the study and provided written consent to participate. If patients were unable to give written consent, their relatives were consulted regarding the provision of consent. Patients were advised of their right to withdraw from the study at any time and that the care they received would not be affected by

their participation status. All data were kept confidential and processed anonymously.

3.4 | Data analysis

The SPSS statistical software IBM version 25 was used to analyse data. Categorical variables were expressed in percentages, while continuous variables were expressed as mean \pm SD (standard deviations). Bar graphs were used to present self-rated VTE attitude. Pie charts were used to present the relative proportions of VTE prophylactic practices. The Excel spreadsheet was used to obtain the bar graphs and pie charts.

4 | RESULTS

4.1 | Characteristics of the study participants

A total of 3,903 nurses from 256 wards in 25 hospitals were recruited in the baseline survey. While extracting data from the baseline survey, four hundred and eighty-five nurses in charge of clinical care for patients undergoing THA or TKA were identified. They were distributed in 16 different hospitals. The mean \pm SD age of the respondents was 29.3 \pm 5.9 years. A majority of the respondents were female (98.4%) and had a bachelor's degree or above (70.1%). Nurses were mostly working at secondary level hospitals (71.8%) and had attended VTE training courses in the wards (94.0%). The demographic characteristics of the participating nurses are presented in Table 1.

4.2 | Orthopaedic nurses' knowledge regarding VTE prophylaxis

Out of a maximum score of 9, the mean knowledge score was 6.59 \pm 1.574 (95% confidence of interval (CI): 6.45–6.73). The overall average accuracy for all the nine knowledge items was 73.4% \pm 17.5% (95% CI: 71.9%–75.0%). The percentage of nurses who were able to properly use mechanical prophylaxis was 78.4%; identify people with a high risk for VTE was 76.1%; properly administer general prophylactic care was 72.2%; identify contraindications for the use of mechanical prophylaxis 63.5%; identify contraindications for the use of pharmacological prophylaxis was 53.6% and identify PE symptoms was 47.4%. 68.9% of nurses ($n = 334$) achieved a median score of 7 points or below (range 0–9), with an accuracy rate lower than 80%.

4.3 | Orthopaedic nurses' attitude towards VTE prophylaxis

Over 98% of the respondents strongly or somewhat agreed that VTE prevention was a crucial and essential part of nursing care. Nurses

TABLE 1 Demographic characteristics of the study participants ($n = 485$)

Variables	<i>n</i> (%)
Age (year), mean \pm SD	29.3 \pm 5.9
Experience in nursing (year), mean \pm SD	7.7 \pm 6.6
Gender	
Male	8 (1.6)
Female	477 (98.4)
Education	
College Degree	145 (29.9)
Bachelor's degree or above	340 (70.1)
Province	
Beijing	51 (10.5)
Guangdong	71 (14.6)
Henan	71 (14.6)
Hubei	94 (19.4)
Sichuan	80 (16.5)
Zhejiang	118 (24.3)
Economic region	
East	240 (49.5)
Middle	165 (34.0)
West	80 (16.5)
Hospital level	
Tertiary hospital	137 (28.2)
Secondary hospital	348 (71.8)
Previous VTE educations	
Training courses in the ward	456 (94.0)
Training sessions in the hospital	387 (79.8)
Training sessions outside the hospital	117 (24.1)
Surveyed the literature and guidelines	260 (53.6)
Interactions with colleagues	342 (70.5)
Attended conferences abroad	9 (1.9)

Abbreviations: SD, standard deviations; VTE, venous thromboembolism.

should take the initiative to assess the risk of VTE and exert preventive measures in clinical practice. About 22% of the respondents strongly or somewhat disagreed with the positive relationships between VTE and low-quality nursing care. These results are shown in Figure 1.

4.4 | The observed practice of VTE prophylaxis

The pharmacological prophylactic method was the highest used (90.9%), followed by IPC (32.4%) and GCS (1.6%). Figure 2 details the observed practice of VTE prophylaxis.

The administration of IPC and GCS was recorded every day during the survey. Table 2 shows how mechanical prophylaxis was used during postoperative hospitalisation. 32.4% of patients

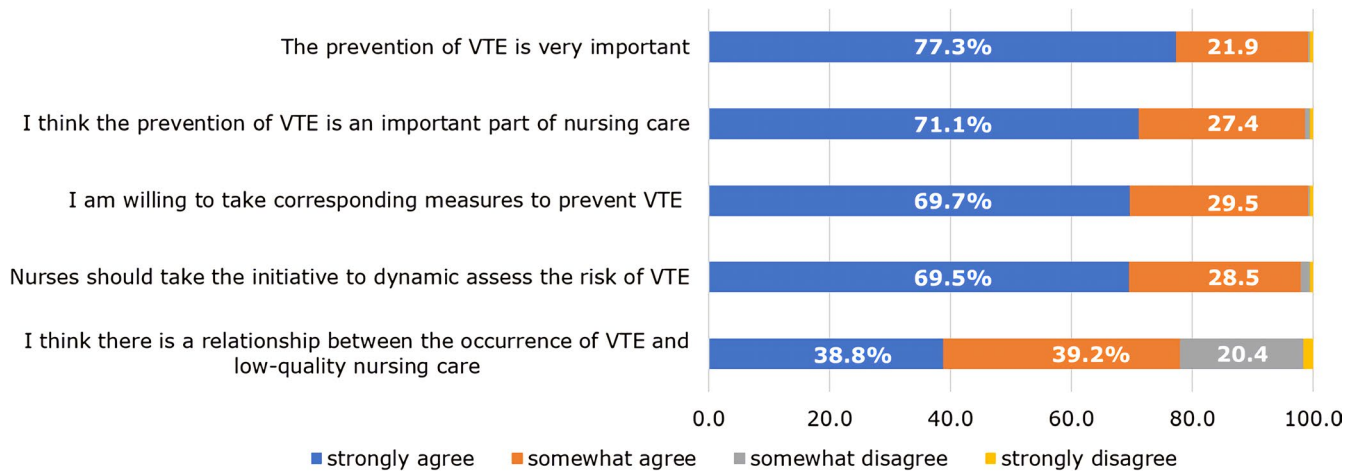


FIGURE 1 Nurses' attitude regarding prophylaxis for venous thromboembolism [Colour figure can be viewed at wileyonlinelibrary.com]

(n = 282) reported 651-day IPC use during 1734 person-days. During the average postoperative hospitalisation period (6 days), patients wore the IPC for an average duration of 2 days. 43-day GCS were used in 1.6% of patients (n = 14) during 156 person-days. During the average 11 postoperative hospitalisation days, patients wore the GCS at an average of 3 days.

5 | DISCUSSION

This study revealed a low level of VTE prophylactic knowledge among orthopaedic nurses based on the results of the knowledge questionnaire survey. The median knowledge score is 7 (range 0–9), and 68.9% of nurses were below the median score. Moreover, one in four nurses was not of the opinion that patients undergoing major surgical procedures were at a higher risk of developing VTE. The accuracy rate in knowledge is, however, higher compared with the national average of 72.92% (Li et al., 2018). Oh et al. documented that only 8.6% of the nurses who corresponded to their study had mastered what VTE prophylaxis entails (Oh et al., 2017). Our study also shows that knowledge accuracy regarding the proper use of prophylaxis, risk factors, signs and symptoms was less than 80%. The nurses were found to be more knowledgeable on DVT than on PE. These findings are in tandem with those documented by Oh et al. (2017).

A study investigating VTE prevention skills among Chinese surgical nurses found that their knowledge was low. The accuracy rate was also lower than 60% (Wang et al., 2017). Lee et al. reported that only 44% of bedside registered nurses rated their knowledge regarding VTE risk assessment as good (Lee et al., 2014). There may be some systematic differences when assessing knowledge using different questionnaires. However, it is undeniable that the nurses' knowledge level regarding VTE prevention was inadequate, and there is an urgent need for additional training.

It is shown that 94.0% of the participants had attended training courses in their wards. This implies that the quality of education regarding VTE prophylaxis in China is low. The relevant system policies and policy support are critical factors influencing the efficacy of VTE prophylactic education. Under the umbrella of the Chinese National Health Commission, the National Program for Prevention and Management of Pulmonary Embolism and Deep Venous Thrombosis was officially launched in October 2018 (Pulmonary Embolism & Pulmonary Vascular Disease Group in Respiratory Disease Branch of Chinese Medical Association et al., 2018). This program relies on medical alliances to promote the timely diagnosis, prevention and treatment of VTE by clinicians, especially clinicians in primary hospitals. However, the potential benefits of this policy are limited because nursing care was not put into consideration. Hospital nurses form the frontline in health

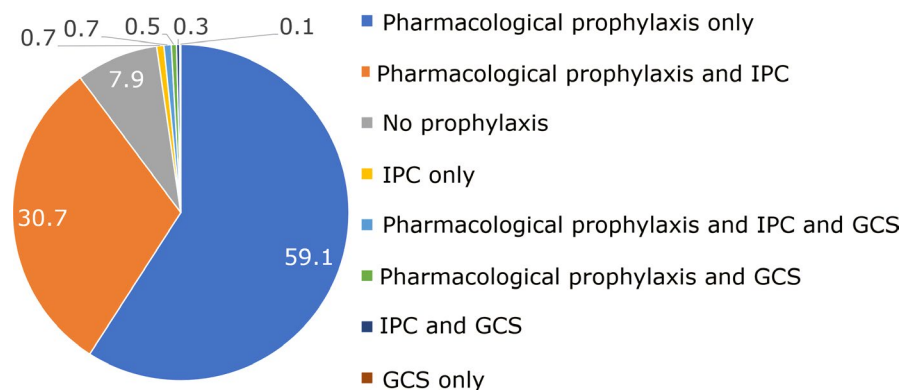


FIGURE 2 The overall utilisation rate of prophylactic measures. IPC, intermittent pneumatic compression; GCS, graduated compression stockings [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 2 Utilisation of mechanical Prophylaxis during postoperative hospitalisation

Variables	Intermittent pneumatic compression (n = 282)					Graduated compression stockings (n = 14)				
	Minimum	Median	Mean (SD)	Maximum	Sum	Minimum	Median	Mean (SD)	Maximum	Sum
Postoperative hospitalisation (day)	1	5	6 (5)	44	1734	2	9	11 (11)	44	156
Average days of using mechanical prophylaxis	1	2	2 (2)	18	651	1	2	3 (4)	13	43
Average hours of daily use	0.3	0.5	0.6 (0.2)	1.5	167	23	24	23.0 (1.0)	24	334

Abbreviation: SD, standard deviations.

service delivery and can effectively translate VTE prevention guidelines into practice. Delivering quality nursing care presents an opportunity for nurses to facilitate changes in clinical practices and drive improvements in nursing care and patients' clinical outcomes (Lockwood et al., 2018). Therefore, policymakers and hospital managers should aim at obtaining a practical multidisciplinary approach for the prevention of VTE and encourage nurses to take ownership of VTE prevention efforts.

Publication and guideline dissemination are not sufficient to ensure that evidence-based recommendations are incorporated in clinical practice (National Institute for Health & Clinical Excellence, 2018). Nurses play essential roles in implementing evidence-based recommendations and improving clinical practice outcomes (Blann, 2014). Their capacity to recognise an early onset of VTE symptoms is key for effective diagnosis and treatment (Erem & Aytac, 2017). However, nurses in our study obtained the lowest scores in VTE prophylaxis, identification of high-risk patients and symptom recognition, especially for PE. Therefore, there is a need to focus on these factors when conducting continuing education.

Nurses exhibited an overall positive attitude concerning prophylaxis after orthopaedic surgery. These findings correspond to those reported in a Chinese study (Zhai et al., 2019). It has also been documented that clinical staff has a positive attitude and in-depth experience regarding VTE control (McFarland et al., 2014). This also explains the effectiveness of the training to a certain extent. Although the knowledge of nurses is still low after participating in the training, their attitude towards prevention has significantly been improved. However, 61.2% of nurses ($n = 297$) in our study were of the opinion that poor-quality care was not associated with a higher prevalence of VTE. This result can be interpreted to mean that VTE management requires a comprehensive, multidisciplinary effort (Collins et al., 2010). Multidisciplinary VTE prevention efforts improve VTE risk stratification and risk-appropriate VTE prophylaxis (Streiff et al., 2012). For nurses to perform specific tasks that are traditionally considered to be non-nursing, it is necessary that they team up with other health professionals (Carryer et al., 2007). For example, through undertaking the risk assessment task that should have been done by doctors, the role of nurses in VTE risk assessment represents an excellent example of multidisciplinary cooperation (Bonner et al., 2008). It is worth noting that doctors, nursing

researchers and nursing managers may need to initiate training programs to improve VTE risk assessment rate and assessment accuracy among clinical nurses.

Pharmacological prophylaxis was the most used measure in VTE during clinical practice. Approximately 90.9% of the patients who had undergone THA and TKA were administered with pharmacological prophylaxis. This study shows that IPC was used for an average of two days in the averaged six-day postoperative hospital stay. Moreover, 1.6% of patients ($n = 14$) received 43-day GCS during 156 person-postoperative hospital days. Previous studies have shown that adherence to IPC ranged from 49%–83% (Froimson et al., 2009), while the proportion of patients not wearing GCS or misuse ranged from 8.3%–74% (Wade et al., 2017). The underutilisation of VTE mechanical prophylaxis is a significant problem worldwide.

Mechanical prophylaxis is effective and safe in most patients because it has a little risk for bleeding or hematoma formation in postoperative patients (Sachdeva et al., 2018; Zhao et al., 2014). It has been recommended that mechanical prophylaxis should be applied day and night until there is a significant improvement in the mobility of the patient (Hill & Treasure, 2007). As mentioned, compliance to GCS using in clinical practice is quite low. This could be attributed to a lack of knowledge regarding mechanical prophylaxis, both including doctors and nurses. In China, nurses are not authorised to prescribe the use of GCS. Therefore, only 1.6% of patients ($n = 14$) using GCS reflected that Chinese doctors seriously neglect the clinical effectiveness of GCS. Other studies confirm this view that some scholars have questioned the effectiveness of GCS (Kahn et al., 2007).

However, during the 156-day hospital stay of 14 patients with GCS, GCS has only been used for 43 days. Discontinuing the use of GCS during the postoperative hospital stay, patient-reported reasons for non-compliance may be the leading cause (Brady et al., 2015). Therefore, it is necessary to investigate whether nurses provide health education on the benefits of using GCS and the correct use of GCS methods. After all, incorrect use of GCS will aggravate the uncomfortable feeling. Chinese studies have shown that only 30.4% of the medical staff could correctly use GCS (Zhai et al., 2019).

This somewhat disappointing result of using IPC 0.6 hours per day on average might result from the limited proportion reimbursed by National Basic Medical Insurance in China. Although China has

achieved almost universal health insurance coverage, insurance benefits are limited (National Medical Security Administration, 2020). We also noticed that IPC was used for an average of two days in the averaged six-day postoperative hospital stay. The reason needs further investigation, as lacking machines or doctors' orders or low nurse compliance all may be the causes.

The Chinese medical association has updated clinical practice guidelines for the prevention of VTE after THA and TKA surgical procedures (Chinese Medical Association Orthopedics Branch, 2016). Academic organisations have also developed guidelines for the proper use of GCS in the prevention and treatment of VTE (Nursing Professional Committee of China Branch of International Vascular Union, & Chinese Medical Association Endovascular Committee, 2019) and the standard of subcutaneous anticoagulant injection (China Intravenous Intervention Alliance, & Peripheral Vascular Intervention Professional Committee of Interventional Physicians Branch of Chinese Medical Doctor Association, 2019). However, no systematic reviews or evidence-based quality appraisals have been done regarding these guidelines. These guidelines are based on recommendations from other national guidelines or expert consensus. High-quality clinical guidelines are key in clinical decision-making. The low-quality VTE prevention guidelines in China are thought-provoking and challenging to implement. As high-quality and evidence-based guidelines increase healthcare providers' confidence in guideline implementation (Lehane et al., 2019), we are of the opinion that guideline development committees should develop comprehensive guidelines for Research and Evaluation II domains.

There were several limitations associated with this study. First, there is an inherent potential for confounding and information bias in conducting a secondary analysis of survey data. Besides, the data source was extracted from an earlier database of VTE prevention, and the differences in data collection period may result in findings that may not truly reflect the current contextual realities. Furthermore, non-random sampling reduces the generalisability of our results. Despite these limitations, this study has considerable strengths. First, sixteen hospitals were selected using the convenience sampling method based on bed size and number of nurses per hospital. In conclusion, this is the first comprehensive multicentric study of Chinese orthopaedic nurses' knowledge, attitude and venous thromboembolic and prophylactic practices. Second, data on the daily use of GCS and IPC were recorded in detail, which offers some insights into the actual use of mechanical prophylaxis measures.

6 | CONCLUSION

VTE is a significant cause of morbidity and mortality after THA and TKA surgical procedures. This study provides the first comprehensive map of Chinese orthopaedic nurses' knowledge, attitude and VTE prophylactic practice. Despite the enthusiasm towards VTE

prophylaxis, their knowledge regarding the proper use of prophylaxis, identification of risk factors, signs and symptoms, especially for PE was low. Moreover, the current mechanical prophylaxis practice for VTE prevention after THA and TKA surgical procedures is not optimistic. Further studies should analyse the causes from multiple perspectives, including the availability of resources, the knowledge and attitude of doctors, nurses and patients. Nursing intervention strategies should be developed to prompt evidence-based nursing practices.

7 | RELEVANCE TO CLINICAL PRACTICE

Orthopaedic nurses should be aware of and be able to implement VTE prevention methods. Attitudes are often the result of experience or education, and they can have a powerful influence over behaviour. After in-depth discussion by combining the guidelines recommendations, the concept of Evidence-based Nursing and the specific clinical scenarios in China, the following items need to be considered in promoting VTE prevention after hip and knee replacement.

First, more attention is needed in the role of nurses in improving VTE prevention care. The quality and effectiveness of continuing VTE prophylactic education courses need to be improved. Second, pharmacological prevention has been commonly used, and nurses need to pay attention to the use of drugs after discharge. Third, the use of mechanical prevention in China is more restricted, and there are a few areas where nurses can intervene. Nurses need to do an excellent job of health education for patients who have received relevant measures, such as those who use GCS, and promote proper use of wearing. Furthermore, nurses urgently need to educate and supervise patients to exercise actively, which may be an effective and cheap alternative to GCS. Finally, leaders also need to take measures to promote the implementation of VTE prevention, such as the accessibility of medical resources and the VTE prevention attitude of doctors.

ACKNOWLEDGMENT

We acknowledge the participation of all nurses included in our study. We acknowledge the data collection support from the nursing departments and medical record departments at the 16 hospitals.

CONFLICT OF INTEREST

The authors declared no conflicts of interest concerning the authorship and publication of this article.

AUTHOR CONTRIBUTIONS

Study design and data collection: YW, XJWu, YFM, JC, JJ; Data collection, data analysis and analysis plan: YW, XY, XJWang, GL, YL, ZL, CZ, LYZ; Writing the first draft: YW, LYZ, JJ, CZ, YFM; Systemic review and manuscript revision: XJWu, XY, JC, GL, XJWang, YL, ZL; Subsequent versions and approval of the final manuscript: all authors.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

How to cite this article: Wang Y, Wu XJ, Ma YF, et al. Chinese orthopaedic nurses' knowledge, attitude and venous thromboembolic prophylactic practices: A multicentric cross-sectional survey. *J Clin Nurs*. 2021;30:773–782. <https://doi.org/10.1111/jocn.15615>