

Knowledge, attitudes, and practices regarding venous thromboembolism prophylaxis

A survey of medical staff at a tertiary hospital in China

Shangpeng Feng, MD^a, Minhui Li, MD^{b,c}, Kai Wang, PhD^d, Cheng Hang, RN^e, Dongmei Xu, RN^f, Ye Jiang, MD^{a,*}, Zhongzhi Jia, PhD^d 

Abstract

To assess the knowledge, attitudes, and practices regarding venous thromboembolism (VTE) prophylaxis among medical staff at a tertiary hospital in China.

A self-administered web-based survey was completed by medical staff, and data about respondent knowledge, attitudes, and practices regarding VTE prophylaxis were gathered and analyzed with chi-square tests, using a 95% significance level.

Of the 2079 medical staff invited to participate in the survey, a total of 2042 (including 921 clinicians and 1121 nurses) responded. The overall rate of correct responses to knowledge items was 57.6%; the rate was 60.1% for clinicians and 55.4% for nurses ($P < .001$). The median affirmative (“strongly agree”/“agree”) rate for attitude items was 99.0% (range, 83.2%-99.4%). Medical staff members were most commonly concerned about the possibility of a financial penalty when a patient could not be treated with VTE prophylaxis (49.4%). Low levels of knowledge and participation of medical staff were identified most commonly as difficulties involved in VTE prophylaxis (48.5%). The median affirmative response rate for practice items was 58.2% (range, 51.1%-68.3%). All affirmative response rates for practice items were significantly higher for nurses than for clinicians (all $P < .001$).

Although the overall attitude toward VTE prophylaxis was positive, the knowledge level was poor, especially among nurses, and the rate of affirmative responses regarding practices was low, especially among clinicians. Medical institutions should improve staff training regarding VTE prophylaxis, and medical staff should be encouraged to actively engage in VTE prophylaxis.

Abbreviation: VTE = venous thromboembolism.

Keywords: prophylaxis, staff, survey, venous thromboembolism

Editor: Maya Saranathan.

SF and ML contributed equally to this work.

This study was supported by the Innovation Research Program of Hospital Management Association of Jiangsu Province (JSYGY-3-2019-451). The funder had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

The authors have no conflicts of interest to disclose.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

^a Department of Cardiology, Changzhou No. 2 People's Hospital, Changzhou, China, ^b Department of Obstetrics and Gynecology, Changzhou, China, ^c Department of Medical Division, Changzhou, China, ^d Department of Interventional and Vascular Surgery, Changzhou, China, ^e Department of Nursing, Changzhou, China, ^f Department of Orthopedics, Changzhou No. 2 People's Hospital, Changzhou, China.

* Correspondence: Ye Jiang, Department of Cardiology, Changzhou No. 2 People's Hospital, Changzhou, China, 213003 (e-mail: juwwjy999@163.com and Zhongzhi Jia, Department of Interventional and Vascular Surgery, Changzhou No. 2 People's Hospital, Changzhou, China, 213003 (e-mail: jiazhongzhi.1998@163.com).

Copyright © 2021 the Author(s). Published by Wolters Kluwer Health, Inc. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial License 4.0 (CCBY-NC), where it is permissible to download, share, remix, transform, and buildup the work provided it is properly cited. The work cannot be used commercially without permission from the journal.

How to cite this article: Feng S, Li M, Wang K, Hang C, Xu D, Jiang Y, Jia Z. Knowledge, attitudes, and practices regarding venous thromboembolism prophylaxis: a survey of medical staff at a tertiary hospital in China. *Medicine* 2021;100:49(e28016).

Received: 16 January 2021 / Received in final form: 30 September 2021 / Accepted: 11 November 2021

<http://dx.doi.org/10.1097/MD.00000000000028016>

1. Introduction

Venous thromboembolism (VTE) is a major public health problem worldwide, and the prevalence of VTE is increasing steadily in developing countries.^[1,2] A common complication among hospitalized patients,^[2,3] VTE presents a challenge for medical staff because of its ambiguous clinical signs and symptoms and its high mortality and morbidity rates.^[2,4] However, VTE is considered a reasonably preventable disease as long as optimal prophylactic strategies are employed.^[2] Medical staff play a key role in preventing VTE by assessing VTE risk and providing appropriate prophylactic measures when necessary, and research has shown that the knowledge and attitudes of clinicians regarding VTE can affect the efficacy of VTE prophylaxis.^[3,5,6]

Despite the importance of medical staff in preventing VTE among hospitalized patients, little research has been performed regarding the knowledge, attitudes, and practices of these medical staffs in regard to VTE prophylaxis. In this survey, we therefore sought to assess these factors among medical staff at a tertiary hospital in China.

2. Methods

2.1. Study design

This survey was approved by our Institutional Review Board and adhered to the Helsinki Declaration. Written informed consent was not required because the survey of medical staff was anonymous and had less than minimal risk.

Table 1
Demographic characteristics of respondents.

Characteristic	All respondents, n (%) (N=2042)	Clinicians, n (%) (N=921)	Nurses, n (%) (N=1121)	P value
Age, yr				<.001
<30	745 (36.5)	149 (16.2)	596 (53.2)	
30–39	862 (42.2)	470 (51.0)	392 (35.0)	
40–49	335 (16.4)	214 (23.2)	121 (10.8)	
50–60	100 (4.9)	88 (9.6)	12 (1.0)	
Years of work				<.001
<5	529 (25.9)	189 (20.5)	340 (30.3)	
5–9	601 (29.4)	236 (25.6)	365 (32.5)	
10–20	579 (28.4)	296 (32.2)	283 (25.3)	
21–30	273 (13.4)	166 (18.0)	107 (9.6)	
≥31	60 (2.9)	34 (3.7)	26 (2.3)	
Educational level				<.001
Bachelor's degree	1395 (68.3)	291 (31.6)	1104 (98.5)	
Master's degree	574 (28.1)	557 (60.5)	17 (1.5)	
PhD	73 (3.6)	73 (7.9)	0 (0)	
Professional title				<.001
Primary title	910 (44.6)	190 (20.6)	720 (64.2)	
Intermediate title	750 (36.7)	409 (44.4)	341 (30.4)	
Senior title	382 (18.7)	322 (35.0)	60 (5.4)	

An electronic questionnaire was administered between September 1, 2019, and October 15, 2019, at a university-affiliated hospital in China. Both clinicians and nurses were recruited for this survey because they provide different types of consultations regarding VTE prophylaxis.

2.2. Questionnaire design

The questionnaire was designed by a research team that included experts with more than 10 years of experience in the field of VTE prophylaxis. The final validated questionnaire included 42 items covering 4 dimensions: 1) demographic data (6 items), 2) knowledge about VTE prophylaxis (21 items), 3) attitudes regarding VTE prophylaxis (9 items), and 4) practices regarding VTE prophylaxis (6 items). The demographic data collected included respondent occupation, age, department, years of work, educational level, and professional title. Questions about attitudes and practices included the following possible responses: “strongly agree,” “agree,” “neutral,” “disagree,” and “strongly disagree.” Answers defined as “affirmative” included responses of “agree” and “strongly agree.”

2.3. Survey procedure

This survey was conducted online via a Chinese survey website (www.sojump.com). A two-dimensional code was sent to medical staff through Wechat; the medical staff could then log in and complete the survey by scanning the two-dimensional code. All participants were asked to objectively and honestly answer the questions. The following two steps were mandatory to complete this survey: 1) participants were asked to report their demographic characteristics; and 2) participants had to complete all questions regarding knowledge, attitudes, and practices. Participants could also make suggestions regarding VTE prophylaxis, but this step was optional.

2.4. Statistical analysis

Statistical comparisons were performed with chi-square tests, using a 95% significance level. All statistical analyses

were performed with SPSS version 17.0 (SPSS Inc., Chicago, Illinois).

3. Results

3.1. Participants

A total of 2079 two-dimensional codes were sent out; of these codes, 2042 were used, which translates to a 98.2% response rate for this survey. The 2042 respondents included 921 clinicians and 1121 nurses. Of the 2042 respondents, 56.7% (1158/2042) had previously treated patients with VTE. The demographic characteristics of study respondents are summarized in Table 1. Compared to clinicians, nurses were younger ($P < .001$), had fewer years of work ($P < .001$), had less education ($P < .001$), and were earlier in their career ($P < .001$).

3.2. Knowledge

The overall rate of correct responses to knowledge items was 57.6%, with a rate of 60.1% for clinicians and 55.4% for nurses ($\chi^2 = 96.4; P < .001$). The rates of correct responses were 60.7% for staff who had previously treated VTE versus 53.5% for staff who had not previously treated VTE ($\chi^2 = 222.7; P < .001$). The rates of correct responses were increased with the increasing of educational level, years of work, age, and professional title (Table 2).

3.3. Attitudes

The median affirmative rate for attitude items was 99.0% (range, 83.2%–99.4%; Table 3). Staff members were most concerned about the possibility of a financial penalty when a patient could not be treated with VTE prophylaxis (49.4%). Compared to clinicians, nurses were more concerned about increased workload, increased medical cost, extended hospital stay, and exacerbation of doctor-patient conflicts (all $P < .05$). A low level of knowledge and participation of medical staff members was most commonly identified as a difficulty involved in VTE prophylaxis (48.5%). Compared to nurses, more clinicians believed that staff knowledge and participation, patient compli-

Table 2
Correct responses to knowledge items.

Characteristic	Correct responses, % (N = 2042)	χ^2	P value
Educational level		137.2	<.001
Bachelor's degree	55.8		
Master's degree	61.2		
PhD	65.5		
Years of work		12.8	.012
<5	56.3		
5–9	57.5		
10–20	58.2		
21–30	58.3		
≥31	59.7		
Age, yr		1371.2	<.001
<30	23.7		
30–39	58.0		
40–49	58.4		
50–60	60.4		
Professional title		73.2	<.001
Primary title	55.6		
Intermediate title	58.1		
Senior title	61.1		

ance, cooperation among different departments, ability of medical specialists to treat VTE, and medical cost were difficulties involved in VTE prophylaxis (all $P < .001$).

3.4. Practices

The median affirmative response rate for practice items was 58.2% (range, 51.1%–68.3%; Table 4). Compared to clinicians, nurses had significantly higher affirmative response rates for these items (all $P < .001$).

3.5. Suggestions

A total of 145 suggestions were collected. These suggestions most commonly focused on improving the quality and

frequency of staff training (n=63, 43.4%) and enhancing self-study (n=31, 21.4%). Other suggestions included implementing an electronic alert system and strengthening cooperation among departments.

4. Discussion

In this survey of medical staff at our institution, we found that 1) the overall knowledge level regarding VTE prophylaxis was poor, especially among nurses; 2) the overall attitudes toward VTE prophylaxis were positive; and 3) the affirmative response rate regarding practices was low, especially among clinicians. Survey respondents suggested that staff training regarding VTE prophylaxis should be improved and that medical staff should engage in self-study to learn more about this topic.

The knowledge of medical staff regarding VTE prophylaxis can affect the efficacy of these practices, with poor knowledge about VTE prophylaxis leading to a lack of standardization and potentially increasing the occurrence of VTE among hospitalized patients.^[5,7,8] Our survey of medical staff found that the knowledge level regarding VTE prophylaxis was relatively poor, especially among nurses. Many factors could contribute to this, including a lack of experience of VTE management, lack of training, lack of self-study, and the relative youth of the respondents. Compared to clinicians, the nurses included in this survey were younger, had fewer years of work, had less education, and were early in their career, which may contribute to the lower knowledge level regarding VTE prophylaxis. Overall, these results suggest that medical staff should be encouraged to increase their knowledge of VTE prophylaxis, especially young staff members with less education who are early in their career.

The overall attitude toward VTE prophylaxis among survey respondents was positive. Since 2017, many efforts have been made at our hospital to prevent the occurrence of VTE; these efforts have included improving the quality and frequency of staff training by enhancing learning opportunities and offering additional educational programs. The positive attitude toward

Table 3
Affirmative responses to items assessing attitudes.

Item	All respondents, n (%) (N = 2042)	Clinicians, n (%) (N = 921)	Nurses, n (%) (N = 1121)	P value
1. VTE risk must be assessed in hospitalized patients.	2018 (98.8)	910 (98.8)	1108 (98.8)	.942
2. A medical specialist must provide therapy to patients with VTE.	2029 (99.4)	914 (99.2)	1115 (99.5)	.525
3. A multidisciplinary team must provide therapy to patients with VTE.	2028 (99.3)	914 (99.2)	1114 (99.4)	.712
4. Staff must be trained regularly regarding VTE prophylaxis.	2012 (98.5)	902 (97.9)	1110 (99.0)	.043
5. VTE prophylaxis can improve the quality of medical care.	2022 (99.0)	913 (99.1)	1109 (98.9)	.645
6. Your medical division encourages you to learn more about VTE prophylaxis.	2028 (99.3)	914 (99.2)	1114 (99.4)	.712
7. Your hospital pays a great deal of attention to VTE prophylaxis.	1699 (83.2)	722 (78.4)	977 (87.2)	<.001
8. What are your concerns regarding VTE prophylaxis?				
Financial penalty when the patient cannot be treated with VTE prophylaxis	1009 (49.4)	460 (49.9)	549 (49.0)	.662
Increased workload	778 (38.1)	321 (34.9)	457 (40.8)	.006
Increased medical cost	680 (33.3)	283 (30.7)	397 (35.4)	.025
Extended hospital stay	653 (32.0)	259 (28.1)	394 (35.1)	.001
Exacerbation of doctor-patient conflicts	551 (27.0)	212 (23.0)	339 (30.2)	<.001
9. What are the difficulties involved in VTE prophylaxis?				
Staffs knowledge and participation	991 (48.5)	675 (73.3)	316 (28.2)	<.001
Patient compliance	976 (47.8)	687 (74.6)	289 (25.8)	<.001
Cooperation among different departments	297 (14.5)	210 (22.8)	87 (7.8)	<.001
Ability of medical specialist to treat VTE	192 (9.4)	112 (12.2)	80 (7.1)	<.001
Medical cost	143 (7.0)	94 (10.2)	49 (4.4)	<.001

VTE = venous thromboembolism.

Table 4
Affirmative responses to items assessing practices.

Item	All respondents, n (%) (N = 2042)	Clinicians, n (%) (N = 921)	Nurses, n (%) (N = 1121)	P value
1. You always assess VTE risk in hospitalized patients.	1188 (58.2)	368 (40.0)	820 (73.1)	<.001
2. You always provide health education regarding VTE prophylaxis for hospitalized patients.	1186 (58.1)	410 (44.5)	776 (69.2)	<.001
3. You can offer advice to patients with VTE.	1043 (51.1)	410 (44.5)	633 (56.5)	<.001
4. You understand and have mastered the VTE risk assessment scales.	1316 (64.4)	451 (49.0)	865 (76.6)	<.001
5. You are familiar with the regulations regarding VTE prophylaxis at your hospital.	1395 (68.3)	536 (58.2)	859 (76.6)	<.001
6. You engage in self-study to learn more about VTE prophylaxis.	1096 (53.7)	426 (46.3)	670 (59.8)	<.001

VTE = venous thromboembolism.

VTE prophylaxis among our medical staff suggests that these efforts are succeeding.

The present study found that medical staff members were concerned about the possibility of a financial penalty if a patient could not be treated with VTE prophylaxis. This suggests that the performance appraisal system for medical staff members at the hospital has been successful. In this system, if VTE risk for hospitalized patients is not assessed, the medical staff members in charge will incur a financial penalty. The survey found that nurses were concerned about increased workload, increased medical cost, extended hospital stay, and exacerbation of doctor-patient conflicts. These results suggest that the hospital's nurses have not fully recognized the importance of VTE prophylaxis. In fact, performing VTE prophylaxis can improve the quality of medical care and decrease the chance of doctor-patient conflicts.

The rate of affirmative responses for practice items was low. This may be related to the relatively low level of knowledge among the medical staff.^[9–11] Of note, although the knowledge level of nurses was poorer than that of clinicians, the rate of affirmative responses regarding practices was higher among nurses, which is due to the VTE prophylaxis is a mandatory question on the nurse's queue on admission and daily assessment of the patient and not a mandatory queue for clinicians. The clinicians were more worried about the difficulties involved in VTE prophylaxis, which may affect overall practices. Our findings suggest that medical staff, especially clinicians, should be encouraged to perform VTE prophylaxis in spite of their concerns regarding potential difficulties.

Respondents' suggestions regarding VTE prophylaxis generally focused on improving the quality and frequency of staff training and enhancing self-study. These results again highlight the importance of education. Thus, medical institutions should improve staff training opportunities, and medical staff should engage in self-study to learn more about VTE prophylaxis, as accurate knowledge is the basis of effective VTE prophylaxis.^[5,12] Respondents also suggested that more efforts should be made to improve VTE prophylaxis, such as implementing an electronic alert system.

This study had several limitations. The survey was administered at a single institution; the findings may not be generalizable to other hospitals because of differing rates of VTE prophylaxis across institutions. In addition, most respondents were young, which may have biased the results. Finally, although the questionnaire was designed by a research team, the survey

may still have contained flaws that could have affected our findings.

In conclusion, although we found that the overall attitude toward VTE prophylaxis was positive at this institution, the knowledge level was poor and the rate of affirmative responses regarding practices was low. In light of these findings, we suggest that medical institutions should improve staff training regarding VTE prophylaxis. In addition, medical staff should be encouraged to improve their knowledge of VTE prophylaxis, especially young staff members with less education who are early in their career.

Acknowledgments

We thank Yan Li, Qiang Xu, Tao Shen, and Zhaopeng Wang for their help with questionnaire design; Liulan Qian and Weixing Zhuang for their help with data analysis; and Megan Griffiths, scientific writer, Cleveland, Ohio, USA, for her help with revising the manuscript.

Author contributions

Conceptualization: Ye Jiang.

Data curation: Zhongzhi Jia.

Formal analysis: Shangpeng Feng.

Writing – original draft: Shangpeng Feng, Minhui Li, Kai Wang, Cheng Hang, Dongmei Xu, Ye Jiang, Zhongzhi Jia.

Correction

When originally published, the corresponding author was incorrectly noted as Zongzhi Jia and has been corrected to Ye Jiang.

References

- [1] Schulman S, Ageno W, Konstantinides SV. Venous thromboembolism: past, present and future. *Thromb Haemost* 2017;117:1219–29.
- [2] Zhang Z, Lei J, Shao X, et al. Trends in hospitalization and in-hospital mortality from VTE, 2007 to 2016, in China. *Chest* 2019;155:342–53.
- [3] Zhai Z, Kan Q, Li W, et al. VTE risk profiles and prophylaxis in medical and surgical inpatients: the identification of chinese hospitalized patients' risk profile for venous thromboembolism (Dissolve-2)-a cross-sectional study. *Chest* 2019;155:114–22.
- [4] Lee LH, Gallus A, Jindal R, et al. Incidence of venous thromboembolism in asian populations: a systematic review. *Thromb Haemost* 2017;117: 2243–60.

- [5] Zhou WH, He JQ, Guo SG, et al. Venous thromboembolism in the emergency department: a survey of current best practice awareness in physicians and nurses in China. *World J Emerg Med* 2019;10:5–13.
- [6] Farge D, Frere C, Connors JM, Ay C, et al. 2019 international clinical practice guidelines for the treatment and prophylaxis of venous thromboembolism in patients with cancer. *Lancet Oncol* 2019;20:e566–81.
- [7] Tang X, Sun B, Yang Y, et al. A survey of the knowledge of venous thromboembolism prophylaxis among the medical staff of intensive care units in North China. *Plos One* 2015;10:e0139162.
- [8] Ruff SM, Ayabe RI, Wach MM, et al. Practice patterns of VTE chemoprophylaxis after discharge following hepatic and pancreatic resections for cancer: a survey of hepatopancreatobiliary surgeons. *J Thromb Thrombolysis* 2019;48:119–24.
- [9] Oh H, Boo S, Lee JA. 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.
- [10] Jiang Y, Zhang N, Tang H. Knowledge, attitude and practice of surgical nurses towards DVT prevention of postoperative patients. *Chin Nurs Manag* 2014;14:1086–9.
- [11] Sun B, Tang X, Liang L, et al. A survey of knowledge and application of mechanical thromboprophylaxis among the medical staff of intensive care units in North China. *Clin Respir J* 2018;12:1591–7.
- [12] 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* 2018;47:102–8.