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# Knowledge and Awareness of Venous Thromboembolism in Intensive Care Units in Zhejiang Province, China: A Cross-Sectional Survey

Authors' Contribution:  
Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
Literature Search F  
Funds Collection G

AG **Jing Yan**  
BC **Jia Zhou**  
BC **Junhai Zhen**  
ABEG **Li Li**

Department of Critical Care Medicine, Zhejiang Hospital, Hangzhou, Zhejiang, P.R. China

**Zhejiang Provincial Critical Care Clinical Research Group**

**Corresponding Author:** Li Li, e-mail: lilihbch@163.com

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**Background:** The 2009 China Intensive Care Units (ICU) prevention guidelines lack venous thromboembolism (VTE) risk assessment. This survey was conducted to assess the risk of VTE, develop and establish a diagnosis, and provide prevention and treatment guidelines for ICU VTE.

**Material/Methods:** A cross-sectional questionnaire survey of ICU doctors ICUs was conducted online in the tertiary and secondary hospitals of Zhejiang province in China. The questionnaire included VTE-related hospital hardware information, VTE awareness, knowledge, and monitoring system.

**Results:** The risk assessment rates at the time of admission and changed disease condition were 67.7% and 60.4%, respectively. D-dimer and ultrasound were commonly used for VTE screening. Heparin is preferred for short-term intravenous anticoagulant therapy, and warfarin is preferred for long-term therapy. We found that 23.53% of the ICUs have bedside ultrasound and staff for ultrasound examination, and 59.4% of the hospitals are equipped with VTE monitoring information systems. The VTE early identification specification is the key to whether the VTE assessment is performed after the patient enters the ICU.

**Conclusions:** The survey assessed the VTE risk and key VTE management elements. However, high heterogeneities were detected in the assessment. The ICU doctors have relatively limited awareness of VTE. Thus, there is an urgent need to update and standardize the ICU VTE guidelines for the prevention and treatment of VTE in China.

**MeSH Keywords:** **Awareness • Intensive Care Units • Knowledge • Venous Thromboembolism**

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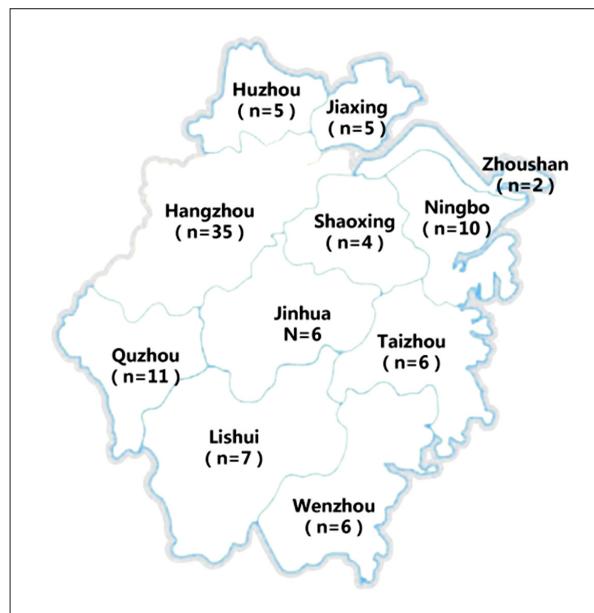
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## Background

The incidence of venous thromboembolism (VTE) [1-5] ranks third among all cardiovascular diseases. It is estimated to annually affect 600 000 patients with deep vein thrombosis (DVT) [6–9] in the United States, and 50 000–200 000 deaths occur due to pulmonary thromboembolism (PTE) [10–12]. The incidence of post-thrombotic syndrome that affects the limbs is 35–69% and 49–100% at 3 and 5 years of DVT, respectively. According to the data, 10% of hospital deaths are caused due to VTE. In Europe, more than 500 000 people die each year due to VTE, which exceeds the combined death toll of acquired immune deficiency syndrome (AIDS), prostate cancer, breast cancer, and highway accidents. VTE is a common disorder in China and other Asian countries. Clinically, only 10–17% of patients with DVT have obvious symptoms of swelling of the lower extremities, local deep tenderness, and dorsiflexion. Severe clinical features and signs of DVT development include pulmonary embolism, with mortality rates of 9–50% and the vast majority of deaths occur within minutes to hours after symptom onset. The signs and symptoms of DVT commonly occur in patients after surgery, trauma, advanced cancer, coma, and prolonged bed rest. In China, the incidence of DVT after orthopedics and general surgery is 10–63% [13]. The exact incidence of VTE in ICU patients is unclear [14], but clinical observations and prospective studies suggest it to be 5–33%. These estimations are closely correlated to knowledge and awareness of the clinical nurses about venous thromboprophylaxis care.

The occurrence of VTE often involves oversight by various departments, and the prevention and treatment of VTE vary in different departments. Critically ill ICU patients are considered to be at high risk for VTE, thereby necessitating great attention [15]. VTE patients in the ICU share similar general risk factors with patients in other departments, such as age, immobilization, obesity, history of VTE, stroke, respiratory or heart failure, pregnancy, and recent surgery, [16–20]. Additionally, specific risk factors for VTE patients in the ICU have been reported [18,14], including mechanical ventilation, vasopressor use, and central venous catheter use. Although there are guidelines and consensus in China, including the China guidelines for the diagnosis and treatment of PTE (2018) and the Chinese patient service and the diagnosis and treatment of hospitalized patients with VTE, problems persist. First, VTE awareness at different levels of hospitals vary, leading to a high degree of heterogeneity in the implementation of guidelines. In addition, specialized guidelines for the ICU are lacking; only 1 China ICU patient DVT prevention guideline has been issued in 2009, but it does not address risk assessment of DVT. Therefore, the present study assessed the awareness of ICU physicians about VTE risk, as well as the current state of the system to provide reference information for promoting the establishment of VTE guidelines for ICUs.



**Figure 1.** Map of Zhejiang province with 11 cities.

The prevalence of VTE is often underestimated in ICUs, as it is often clinically unnoticeable and difficult to diagnose. Therefore, this study conducted a questionnaire survey on the knowledge and awareness of ICU VTE in Zhejiang province in China to enhance the awareness and perception of the clinical staff for improving VTE prevention and treatment in the ICU. These findings highlight the need to develop and implement new ICU VTE guidelines in China [21–26].

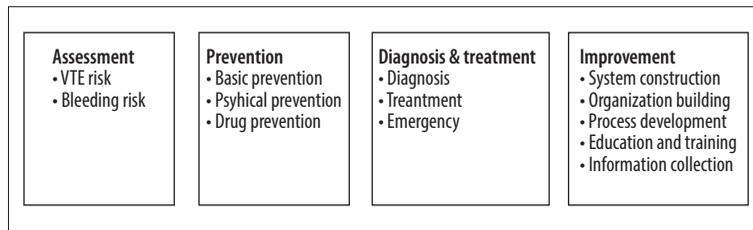
## Material and Methods

### Study design

A cross-sectional survey of doctors currently working in ICUs in Zhejiang province, China, was conducted. Zhejiang province has 11 cities (Figure 1). The questionnaire was independently reviewed by 3 doctors (1 chief physician and 2 deputy-chief physicians) to ensure the clarity and readability of the questions. The questionnaires were obtained as online forms and directly sent to the ICU chief or deputy-chief physician of leading tertiary and secondary hospitals via the WeChat app.

### Questionnaires setting

The questionnaire was developed after extensive literature review of current clinical practice based on Chinese guidelines for the diagnosis and treatment of PTE (2018) and Chinese patient service and the diagnosis and treatment of hospitalized patients with VTE. The contents included a total of 52 questions regarding doctor's personal information, hospital hardware information, VTE awareness, and knowledge of VTE assessment, identification,



**Figure 2.** Key elements of VTE management in the Intensive Care Units (ICU).

**Table 1.** Baseline characteristics.

	Total (n=96)	Tertiary hospitals (n=70)	Secondary hospitals (n=26)
Average number of ICU beds	23.95±11.38	26.57±11.72	16.88±6.44
The ratio of physicians to beds	0.47±0.15	0.50±0.15	0.40±0.13
The ratio of nurse to beds	1.91±0.52	2.02±0.51	1.60±0.42
The ratio of rehabilitation physician to beds	0.02±0.04	0.02±0.04	0.02±0.05
The ratio of respiratory physician to beds	0.03±0.06	0.03±0.06	0.01±0.03
The ratio of DVT physical prevention equipment to beds	0.10±0.05	0.09±0.04	0.13±0.05
The ratio of intermittent pneumatic compression devices to beds	0.21±0.37	0.22±0.43	0.16±0.12
The ratio of plantar pump to beds	0.03±0.06	0.03±0.06	0.04±0.07
The average number of anti-embolism elastic stockings (set)	4.12±9.58	4.99±10.71	1.67±4.55

and monitoring (Supplementary material). The components of the questionnaire covered the 4 key elements of ICU VTE management, including assessment, prevention, diagnosis and treatment, and improvement (Figure 2). All the questions must be answered and submitted online to enter the survey database.

### Distribution and collection

The questionnaires were distributed to 108 chief or deputy-chief physicians in the tertiary and secondary hospitals of Zhejiang province via online WeChat groups. Each ICU was represented by a doctor. After 1 week, the online questionnaire survey was closed, and the data were summarized and analyzed. In case of any repetitive answer sheets from 1 ICU, it was necessary to check whether the answers for the questionnaire were identical. One questionnaire was chosen if the answers are identical, and if not, 1 extra step of the phone call was made to the corresponding ICU department to confirm the answers.

### Statistical analysis

SPSS 22.0 statistical software (IBM SPSS Inc.) was used for statistical analysis. The data were represented as frequency, percentage, mean, and standard deviation, and the rank-sum test was used to compare data between the 2 groups. The risk factors of VTE awareness were analyzed by multivariate logistic regression. The difference was statistically significant if  $P < 0.05$ .

## Results

### Baseline characteristics

From July 6 to 12, 2019, a total of 172 questionnaires were distributed; of these, 96 were considered valid, with an effective recovery rate of 56%. A total of 96 questionnaires were completed, which encompassed 70 tertiary hospitals and 26 secondary hospitals. Among these, there were 88 general ICUs, 4 were emergency ICUs, and 4 were internal medicine or surgical ICUs. The 70 tertiary hospitals, including 63 general ICUs, 1 internal medical ICU, 2 surgical ICUs, and 4 emergency ICUs, were surveyed. The 26 hospitals surveyed included 25 general ICUs and 1 internal medical ICU. Together, all hospitals consisted of an average number of ICU beds of  $23.95 \pm 11.38$ . The average number of beds in tertiary hospitals was  $26.57 \pm 11.72$ , and that of secondary hospitals was  $16.88 \pm 6.44$ . However, the ratio of physicians to beds, nurses to beds, rehabilitation physicians to beds, and respiratory physicians to beds was  $0.47 \pm 0.15$ ,  $1.91 \pm 0.52$ ,  $0.02 \pm 0.04$ , and  $0.03 \pm 0.06$ , respectively. In terms of DVT-related hospital hardware information, the ratio of DVT physical prevention equipment to beds, intermittent pneumatic compression devices to beds, and plantar pumps to beds was  $0.10 \pm 0.05$ ,  $0.21 \pm 0.37$ , and  $0.03 \pm 0.06$ , respectively. The average number of anti-embolism elastic stockings was  $4.12 \pm 9.58$  (Table 1).

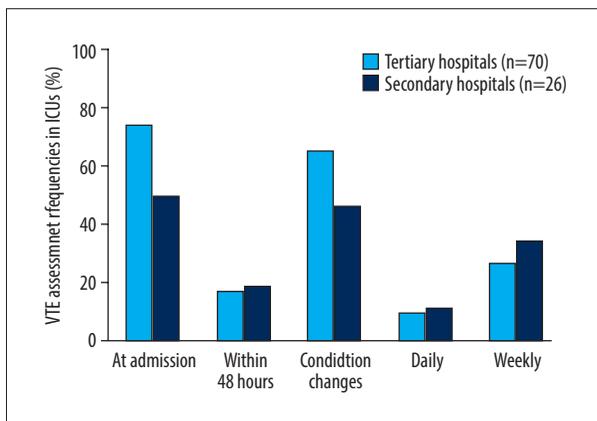


Figure 3. VTE assessment frequencies in the ICUs of Zhejiang province, China.

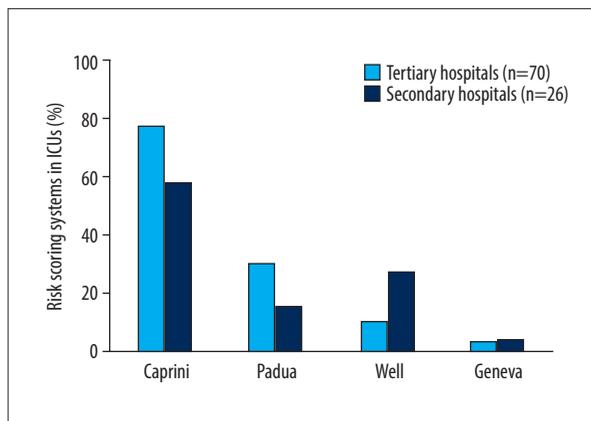


Figure 4. VTE risk scoring systems in the ICUs of Zhejiang province, China.

Table 2. VTE clinical treatments.

	Total (n=96)	Tertiary hospitals (n=70)	Secondary hospitals (n=26)
Preferred drugs for thrombolytic therapy			
Urokinase	20 (20.8%)	13 (18.6%)	7 (26.9%)
rt-PA	76 (79.2%)	57 (81.4%)	19 (73.1%)
Others	0	0	0
Preferred drugs for short-term intravenous anticoagulant therapy			
Standard heparin	6 (6.3%)	6 (8.6%)	0 (0%)
Low molecular weight heparin	90 (93.8%)	64 (91.4%)	26 (100%)
Direct Factor IIa inhibitor	0	0	0
Preferred drugs for long-term anticoagulant therapy			
Warfarin	75 (78.1%)	53 (75.7%)	17 (84.6%)
Direct Factor Xa inhibitor	19 (19.8%)	17 (24.3%)	2 (7.7%)
Direct thrombin inhibitors	0	0	0
Rehabilitation or physical function exercise	15 (15.6%)	10 (14.3%)	5 (19.2%)

rt-PA – recombinant tissue plasminogen activator.

Doctors are regarded as ICU directors or deputy directors for clinical work in the hospitals of Zhejiang province, consisting of 88% chief physicians and 12% deputy-chief physicians.

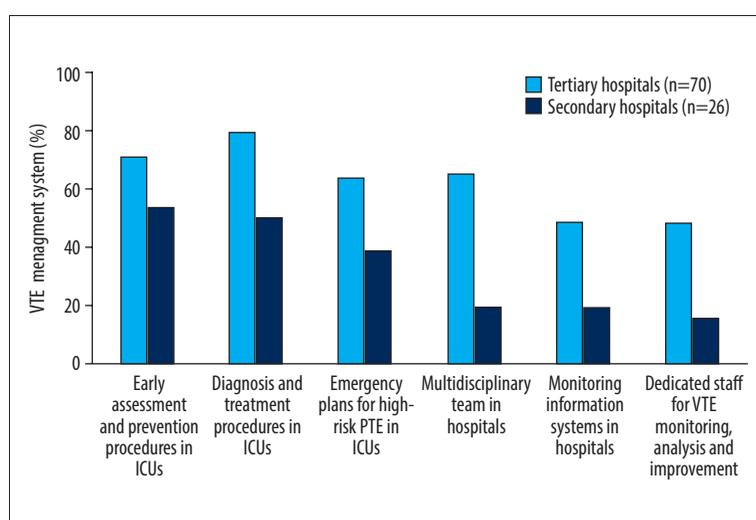
**Awareness of assessment and treatment of VTE**

D-dimer and early electrocardiogram screening are crucial for the analysis of the risk factors of VTE awareness. Strikingly, in the ICU departments of China, D-dimer and ultrasound are commonly used for screening, wherein 59.4% of 96 ICUs prefer ultrasound as their first choice of device, and 88.5% of the ICUs have bedside ultrasound equipment. Ultrasound plays a

major role in early VTE screening, but only 80.21% of the ICUs have early ultrasound screening for VTE. The main reasons for the unavailability of ultrasound included no ultrasound qualification (57.89%), insufficient staff (42.11%), and no equipment (36.84%). The 96 ICUs with bedside ultrasound machines accounted for 88.54%. For ICUs with bedside ultrasound, only 23.53% (20) included professional staff responsible for bedside ultrasound examination, which might make it difficult to ensure the quality of inspection and quality control. Among the staff from 20 ICUs, 13 were ICU doctors (65%), 6 were sonographers (30%), and 1 was an ICU doctor and sonographer. All ICU doctors who performed bedside ultrasound examinations

**Table 3.** VTE management rules and regulations systems.

	Total (n=96)	Tertiary hospitals (n=70)	Secondary hospitals (n=26)
VTE management rules and regulations in hospitals	35 (36.5%)	19 (27.1%)	16 (61.5%)
VTE management rules and regulations in ICUs	26 (27.1%)	13 (18.6%)	13 (50.0%)
VTE prevention and control rules in hospitals	19 (19.8%)	6 (8.6%)	13 (50.0%)
Emergency plan for high-risk PTE in ICUs	41 (42.7%)	25 (35.7%)	16 (61.5%)
VTE diagnostic and treatment specifications in ICUs	27 (28.1%)	14 (20.0%)	13 (50.0%)
VTE early identification specification in ICUs	32 (33.3%)	20 (28.6%)	12 (46.2%)
VTE multidisciplinary prevention and control groups	45 (46.9%)	24 (34.3%)	21 (80.08)
VTE monitoring systems	57 (59.4%)	36 (51.4%)	21 (80.8%)



**Figure 5.** VTE management system in the ICUs of Zhejiang province, China.

were qualified for the same, wherein 11.5% had general ultrasound training, and only 2.1% had ultrasound specialist training.

The criteria for VTE clinical risk assessment and awareness mainly focused on the admission and the condition of disease changes, which included patients with a risk assessment rate of 67.7% and 60.4%, respectively (Figure 3).

The VTE risk score plays a critical role in assessing disease. The Caprini scoring system was used in 69 (71.9%) ICUs, but the Padua, Well, and Geneva scoring systems were not used routinely (Figure 4).

For VTE clinical treatment, recombinant tissue plasminogen activator (rt-PA) accounted for 80% of the preferred drugs for thrombolytic therapy, while the use of urokinase in secondary hospitals was slightly higher than that in tertiary hospitals (Table 2). The preferred drug for short-term intravenous anticoagulant therapy is low molecular weight heparin (LMWH),

the preferred drug for anticoagulant therapy for long-term therapy is warfarin, and the use of new oral anticoagulant drugs is still relatively low (<30%), even in tertiary hospitals.

### VTE management rules and regulations

The management rules and regulations for VTE were established in 27.1% of the ICU departments, and multidisciplinary VTE prevention and control was performed in 46.9% of the ICU departments. In the VTE prevention and control team, the number of respiratory doctors remained relatively low, consisting mainly of doctors and nurses from the ICU department, followed by rehabilitation doctors. In the VTE multidisciplinary treatment team, the proportion of respiratory departments was relatively low. Also, there were fewer VTE monitoring information systems in the hospital (Table 3).

Although 76.04% of the ICUs included VTE assessment and prevention procedures, only 5.48% of the ICUs had dedicated

staff to conduct the VTE assessment and prevention management. We found that 66.67% of the ICUs developed early VTE identification specifications, 71.88% of the ICUs developed VTE diagnostic and therapeutic specifications, and 57.29% of the ICUs developed high-risk PTE emergency plans. Only 40.63% of hospitals had VTE monitoring information systems, and 39.58% of the ICUs had dedicated staff for monitoring, analysis, and improvement of VTE (Figure 5).

### Risk factors of VTE awareness

After multivariate regression analysis, the early identification of VTE remained the key factor determining whether the disease was assessed after the patient entered the ICU (OR=20.47, P=0.005).

## Discussion

The awareness of VTE in the ICUs varies among hospitals. Significant differences were found regarding VTE knowledge, awareness, the formation of rules and regulations, and hardware conditions at different levels of hospitals. To prevent and treat VTE in ICUs, VTE awareness should be improved.

The number of beds in China's ICUs is high, but the number of specialists and the amount of equipment remains low, which might in turn may affect the prevention and detection of conventional VTE. In recent years, the incidence of VTE has been increasing in critically ill ICU patients. A global ENDorse survey revealed that 41.5% of medically ill patients were deemed to be at risk for VTE in the ICU, ranging from 31.2% of patients with gastrointestinal/hepatobiliary diseases to 68.1% with ischemic stroke and up to 100% with acute heart failure, active non-infectious respiratory diseases, or pulmonary infections [1,2,27]. In China, VTE training and assessment showed rapid development in the prevention and treatment of VTE in the ICU. The current results demonstrated that VTE has become a routine assessment in ICUs. The Caprini scoring system has been adopted by most of the ICUs that are now focusing on VTE assessment during patient admission and are altered in the patient's condition. Despite advances in the management of VTE, the knowledge of the Asian population regarding the incidence, prevalence, recurrence, and risk factors is limited, requiring an increase in the awareness of VTE. Although there are ICU VTE-related guidelines and consensus from 2009, there is no information regarding risk assessment. ICU physicians need to improve their awareness of VTE and need for prevention guidelines for Chinese ICU patients. The DVT prevention guidelines issued in 2009 for ICUs do not cover VTE risk assessment. Typically, the clinical assessment, diagnostic testing, therapeutic considerations, and risk factors for VTE are identical in Asian and Western populations [28].

Intriguingly, the treatment plans for VTE are not consistent among ICUs. LMWH is applied in 93.8% of ICUs. It is a crucial drug used as an anticoagulant therapy in ICUs, with a molecular weight between 3.5 and 5.0 kDa. Due to the low molecular weight, the biochemical and pharmacological properties are improved; thus, it has more advantages, such as good absorption, long half-life, high bioavailability, and no requirement for lab monitoring, in contrast to standard heparin [29]. The robust antithrombin effect of heparin has been the main cause of ICU hemorrhagic syndrome and thus is used in only 6.3% of ICUs. Since LMWH mainly induces anticoagulation activity factor Xa and has less effect on antithrombin, it can reduce adverse reactions such as hemorrhage caused by heparin and achieve effective anticoagulant function; thus, it primarily applied for anticoagulation in ICUs [30]. For VTE prophylaxis, there is no evidence suggesting that the bleeding risk in Asians using LMWH is higher than that in the Western population [28]. The conventional drug warfarin was used in 78.1% of the ICUs, while the usage ratio of novel oral anticoagulants (NOACs) was relatively low. Warfarin application requires monitoring of international normalized ratio (INR), which is a relatively cumbersome procedure. Moreover, the activity of metabolizing the enzyme of warfarin in the liver of Asians is quite different from that for the Western population; therefore, the dose should be lowered. The optimal INR range for Asians is narrower, between 0.7% and 1.1%, as compared to that for other populations, and the risk of intracranial hemorrhage is significantly higher than in the Western population, while the INR is lower [31,32]. Also, the NOACs might be more suitable for Asians [33]; nonetheless, the low proportion could be attributed to drug awareness and price. In the thrombolytic process, the use of recombinant tissue-type plasminogen activator (rt-PA) and LMWH also remained higher. However, this study did not investigate compliance with American College of Chest Physicians (CHEST) guidelines for antithrombotic therapy with respect to VTE disease guidelines [34].

Currently, Chinese hospitals are actively establishing VTE prevention and control systems. They are establishing active and effective risk assessment tools, developing effective prevention methods and strategies, and standardizing VTE prevention, diagnosis, and treatment. Despite these advances in the management of VTE, knowledge on the incidence, prevalence, recurrence, and risk factors is limited and requires increased awareness. At present, in China, the ICUs, hospitals, and administrative departments are focusing on VTE management and a comprehensive prevention and treatment system that involves the participation of management departments and multidisciplinary clinics. Although it takes a long time to implement this strategy, the VTE awareness of Chinese doctors and patients would be greatly improved, and a large number of treatments would be standardized.

Nevertheless, it is necessary to revise the guidelines for Chinese ICU patients, strengthen the promotion of guidelines, and improve the hospital equipment, software, information facilities, and the need for VTE system construction. In addition, national evidence-based clinical practice guidelines should be developed and implemented to reduce this variability and improve VTE management in China [28].

The other limitations of this study were as follows: Zhejiang is a developed province in China, albeit with limited representation. No random sampling was conducted, and hence, the sample collection of hospitals might be biased. In addition, the sample size was limited and does not encompass all ICUs of Zhejiang province, the questionnaire lacked standard questions, and the reliability and validity of the questionnaire were not strictly evaluated. Finally, this survey lacked VTE (DVT and PE) morbidity data.

## Conclusions

ICU doctors have relatively limited knowledge about VTE, no consistency regarding the awareness of VTE, and relatively poor practices regarding DVT prevention and control. Thus, establishing and implementing standardized guidelines for ICU VTE in China could help increase knowledge and awareness of doctors regarding VTE, which would improve the risk evaluation of VTE, ultimately improving prevention and treatment.

## Availability of data and materials

The completed questionnaires were collected and safely stored in the principal investigator's office. Data were saved into an appropriately designed Excel spreadsheet. The datasets used and analyzed are available from the corresponding author on request.

## Acknowledgments

We would like to thank Dr. Fabao Zhang for his valuable help with data analysis.

## Conflict of interests

The authors declare that they have no competing interests.

## Supplementary Material



### Invitation from Zhejiang Critical Clinical Research Group (ZJCCR Group) on “Current status of Prevention and Treatment of Venous Thromboembolism (VTE) in ICU in Zhejiang Province, China: A Cross-section Survey”

Dear ICU fellow members,

ICU patients are a high-risk group of population with venous thromboembolism (VTE). Once VTE occurs, especially pulmonary thromboembolism (PTE), the patient has a poor prognosis or even sudden death. Therefore, early screening, early assessment, and early prevention of VTE are important for patients admitted to the ICU. In order to understand the current status of VTE prevention and treatment in the ICU in Zhejiang Province, the Zhejiang Critical Clinical Research Group (ZJCCR Group) issued an invitation to colleagues in the province to participate in our study. In your busy schedule, please take 5 minutes to complete the following survey. Thank you!

1. For this questionnaire survey on the current status of the prevention and treatment of pulmonary thromboembolism (VTE) in the ICU in Zhejiang Province, are you voluntarily participated and willing to announce the results? We will keep your affiliation name confidential. [Single-choice question]\*

Yes

No

2. You are from [fill in the blank] \*

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3. Name of your hospital [fill in the blank] \*

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4. The grade of your hospital is [Single-choice question]\*

Grade 3A     Grade 3B     Grade 2A     Grade 2B

5. The ICU where you work is [Single-choice question] \*

Comprehensive ICU     Internal medicine ICU     Surgical ICU     Emergency ICU

Other ICU

6. There is a total of \_\_\_\_\_ hospital beds in your ICU (beds) [fill in the blanks] \*

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7. There is a total of \_\_\_\_\_ doctors in your ICU (number) [fill in the blanks] \*

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8. There is a total of \_\_\_\_\_ nurses in your ICU (number) [fill in the blanks] \*

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9. There is a total of \_\_\_\_\_ respiratory therapist in your ICU (number) [fill in the blanks] \*

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10. There is a total of \_\_\_\_\_ rehabilitation therapist in your ICU (number) [fill in the blanks]\*

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11. Are there any physical prevention devices for DVT in your ICU? [Single-choice question] \*

No                       Yes

12. If yes, how many intermittent pneumatic compression devices (set) does your ICU have? [fill in the blank] \*

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13. If yes, how many sole vein pumps (set) does your ICU have? [fill in the blank] \*

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14. If yes, how many anti-emboli stretch socks (set) does your ICU have? [fill in the blank] \*

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15. What is the first-choice of physical prevention device for DVT in your ICU? [Single-choice question] \*

Intermittent pneumatic compression device    Sole vein pump    Anti-emboli stretch socks

16. Does your ICU routinely exclude VTE early (within 48 h) for ICU admission patients? [Single-choice question] \*

No                                       Yes

17. If yes, the first-choice of technology for early screening of VTE in your ICU is [single-choice question] \*

D-dimer             Ultrasound             Pulmonary arterial CTA             Venography

CT Venography    Others \_\_\_\_\_ \*

18. Does your ICU regularly assess and screen patients for VTE? [Single-choice question] \*

No                                       Yes

19. If yes, the frequency of VTE screening for ICU patients are (multiple choices possible) [multiple choice questions] \*

At ICU admission             When the condition of disease changes             Daily evaluation    Weekly evaluation

When transferring out of the ICU    Others \_\_\_\_\_ \*

20. Does your ICU conduct a VTE risk assessment for each patient admitted to the ICU? [Single-choice question] \*

No                                       Yes

21. If yes, the frequency of VTE risk assessment for ICU patients are (multiple choices possible) [multiple choice questions] \*

At ICU admission             When the condition of disease changes             Daily evaluation    Weekly evaluation

Transferring out of the ICU             Others

\_\_\_\_\_ \*

22. If yes, what scoring system does your ICU use for VTE risk assessment of patients (multiple choices possibly) [multiple choice questions] \*

Caprini    Padua    Wells    Geneva

Others

\_\_\_\_\_ \*

23. Which drug is the first-choice for thrombolytic therapy in VTE patients in your ICU? [Single-choice question] \*

Urokinase             rt-PA

Others \_\_\_\_\_ \*

24. Which drug is the first-choice for short-term intravenous anticoagulation in your ICU? [Single-choice question] \*

- Unfractionated heparin
- Low-molecular-weight heparin
- IIa factor inhibitors (such as argatroban, etc.)
- Others \_\_\_\_\_ \*

25. Which drug is the first-choice for long-term oral anticoagulation in your ICU? [Single-choice question] \*

- Warfarin
- Xa factor inhibitors (such as rivaroxaban, etc.)
- Direct thrombin inhibitors (such as: bivalirudin, etc.)
- Others \_\_\_\_\_ \*

26. Which drug is the first-choice for long-term oral antiplatelet therapy in your ICU? [Single-choice question] \*

- Aspirin
- Plaudio-videoi formatx
- Others \_\_\_\_\_ \*

27. Does the risk of bleeding in patients receiving anticoagulation and / or antiplatelet therapy regularly be assessed in your ICU? [Single-choice question] \*

- No  Yes

28. If yes, the frequency for assessing the risk of bleeding in patients receiving anticoagulation and / or antiplatelet therapy in your ICU are (multiple choices) [multiple-choice question] \*

- At the ICU admission  When the condition of disease changes  Daily evaluation  Weekly evaluation
- When transferring out of ICU  Others \_\_\_\_\_ \*

29. Does your patient undergo intensive rehabilitation or limb function exercise in the ICU? [Single-choice question] \*

- No  Yes

30. If yes, the staff in your ICU who performed intensive rehabilitation or limb function exercise for the patient is (multiple choices possible) [multiple choice questions] \*

- ICU Doctor  ICU Nurse  Respiratory therapist  Rehabilitation therapist
- Supported by family members  Others \_\_\_\_\_ \*

31. Does your hospital have corresponding rules and regulations for VTE prevention and treatment? [Single-choice question] \*

No  Yes

32. Does your ICU have corresponding rules and regulations for VTE prevention and treatment? [Single-choice question] \*

No  Yes

33. Does your hospital have established a team for the prevention and treatment of VTE? [Single-choice question] \*

No  Yes

34. Does your ICU have established a team for the prevention and treatment of VTE? [Single-choice question] \*

No  Yes

35. If yes, the composition of the VTE prevention and treatment team includes (multiple choices possible) [multiple choice questions]\*

Administrative department  ICU doctor  ICU nurse  Respiratory therapist

Rehabilitation department  Vascular surgery  Interventional department  Logistical personnel or Nursing workers

Others \_\_\_\_\_\*

36. Does your ICU have a VTE assessment and prevention process? [Single-choice question] \*

No  Yes

37. If yes, the main person responsible for the VTE assessment and prevention process in the ICU is [multiple choice questions] \*

ICU doctor  ICU nurse  Full-time medical staff  Others \_\_\_\_\_\*

38. Does your ICU have the ability to screen for VTE early with ultrasound? [Single-choice question] \*

No  Yes

39. If not, the main reason is [multiple choice questions] \*

Lack of ultrasound equipment  Insufficient staff  No ultrasound qualification  Others \_\_\_\_\_\*

40. Is your ICU equipped with a bedside ultrasound machine? [Single-choice question] \*

No  Yes

41. If yes, how many bedside ultrasound machines (set) are equipped? [fill in the blanks] \*

\_\_\_\_\_

42. If yes, is there a person responsible for bedside ultrasound? [Single-choice question] \*

No  Yes

43. If yes, the person responsible for the bedside ultrasound is [single choice question] \*

ICU doctor     Ultrasound doctor     Others \_\_\_\_\_ \*

44. If the bedside ultrasound examiner is an ICU medical staff, does he/she have ultrasound qualifications? [Single-choice question]\*

No                       Yes

45. If he/she has the ultrasound qualification, the training is [Single-choice question] \*

Intensive ultrasound training     Ultrasonic special training  Other \_\_\_\_\_

46. Does your ICU have an early identification specification for VTE? [Single-choice question] \*

No                       Yes

47. Does your ICU have diagnostic and treatment specifications for VTE? [Single-choice question] \*

No                       Yes

48. Does your ICU have an emergency plan for high-risk PTEs? [Single-choice question] \*

No                       Yes

49. Does your hospital have a fixed VTE multidisciplinary treatment system? [Single-choice question] \*

No                       Yes

50. If yes, multi-disciplinary includes (multiple choices possible) [multiple choice questions] \*

Administrative Department     Critical Care Medicine Department     Vascular Surgery  Chest Surgery

Department of Vascular Intervention     Department of Cardiology  Department of Respiratory Medicine

Others \_\_\_\_\_ \*

51. Does your hospital have a VTE monitoring information system? [Single-choice question] \*

No                       Yes

52. Does your ICU have a dedicated person responsible for VTE monitoring, analysis and improvement? [Single-choice question] \*

No                       Yes

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