

Clinical Characteristics, Risk Factors, and Graduated Compression Stockings Use among Patients with Venous Thromboembolism: A Multicenter Prospective Study

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Abstract: This multicenter, prospective observational study included 442 patients with venous thromboembolism (VTE) from 13 hospitals in Anhui Province, China, aiming to systematically analyze their clinical characteristics, risk factors, and use of graduated compression stockings (GCS). The results showed that deep vein thrombosis (DVT) was the predominant clinical presentation (97.1%), of which 87.8% were isolated DVT. Patients with concurrent DVT and pulmonary embolism (PE) had a significantly higher prevalence of pre-existing cardiovascular disease compared to those with isolated DVT or PE ($P < 0.05$). The five most common risk factors were: history of COVID-19 infection (48.2%), hypertension (28.5%), smoking history (15.6%), obesity (body mass index [BMI] ≥ 28 kg/m², 14.5%), followed by diabetes mellitus and admission for surgical treatment (10.0% each). Among patients with lower-extremity DVT, long-term adherence to graduated compression stockings (GCS) following discharge was suboptimal: only 26.1% maintained consistent use over two months, while 63.7% never used GCS during the entire follow-up period. Multivariate logistic regression revealed that a history of COVID-19 infection ($OR = 0.227$, 95% CI: 0.139 – 0.370) and BMI ($OR = 1.069$, 95% CI: 1.006 – 1.136) were independent predictors of sustained GCS use. This study provides real-world data on the disease spectrum, risk profile, and secondary prevention practices of VTE patients in a regional Chinese population, offering important evidence for targeted strategies to improve post-discharge GCS adherence and optimize long-term comprehensive management.

Keywords: Venous thromboembolism; Clinical characteristics; Risk factors; Graduated compression stockings; Multicenter prospective study

1 Introduction

Venous thromboembolism (VTE), encompassing pulmonary embolism (PE) and deep vein thrombosis (DVT), is a chronic and recurrent vascular disorder, ranking as the third leading cause of cardiovascular-related mortality globally (Heit, 2006; Raskob et al., 2014; Spencer et al., 2009). Epidemiological studies indicate that approximately 10 million individuals across diverse ethnic groups are affected by VTE an-

nually in the United States (Olaf & Cooney, 2017). In China, the incidence of VTE among hospitalized patients has risen markedly, with high-risk populations such as surgical inpatients exhibiting a prevalence as high as 53.4% (Zhang, 2021). Furthermore, VTE incidence demonstrates a clear upward temporal trend and considerable interindividual variability (Cohen et al., 2017). This substantial disease burden stems from a complex interplay of multiple risk factors (Guntupalli et al., 2023), which may be hereditary (e.g., ge-

netic variants), non-predisposing [e.g., age, sex, ethnicity, body mass index (BMI), oral contraceptive use, hormone therapy, statin intake, dietary patterns, physical activity, smoking, and air pollution], or predisposing environmental conditions (e.g., malignancy, surgery, trauma, immobilization, pregnancy, long-distance travel, hospitalization, catheterization, and acute infection) (Crous-Bou, Harrington, & Kabrhel, 2016).

Beyond its acute life-threatening nature, VTE is associated with significant long-term sequelae that substantially impair patients' quality of life. Post-thrombotic syndrome (PTS), the most prevalent chronic complication of DVT, is characterized by persistent symptoms including limb pain, edema, venous ulcers, and cutaneous changes, which are typically exacerbated by physical activity (Prandoni et al., 2024). Attributable primarily to residual venous obstruction and valvular reflux, PTS affects an estimated 50% of DVT patients, manifesting as persistent physical discomfort, skin discoloration, and ulceration (Skervin et al., 2016). On average, individuals with PTS incur approximately \$4,000 in annual direct healthcare costs, primarily for nursing care and wound management supplies, alongside significant indirect costs from lost income and reduced economic productivity due to work absenteeism (Ashrani & Heit, 2009).

PTS presents with diverse and often insidious symptoms, frequently developing in patients recovering at home after hospital discharge for DVT, which has contributed to the persistent challenge in its effective management (Lv et al., 2024). Evidence indicates that compression therapy lasting less than six months (Zhang et al., 2022) or the absence of elastic support (Yao, 2020) constitutes a significant risk factor for PTS. Conversely, consistent use of compression therapy can effectively delay its onset and mitigate the risk of developing PTS (Meng et al., 2023). Graduated compression stockings (GCS), as the primary form of compression therapy, should be applied following individualized principles. For patients with acute or sub-acute lower-extremity DVT, such therapy not only alleviates the severity of symptoms such as lower limb swelling and pain but also reduces the incidence of medium- to long-term PTS, and is indicated for the majority of individuals with lower-extremity DVT (Kahn et al., 2014; Lv et al., 2024). The mechanism of action of GCS involves the application of graduated pressure. This is achieved by exerting maximum

pressure at the ankle, which then progressively decreases up the limb. This provides graduated pressure encouraging blood and lymph to flow from distal to proximal (Machin et al., 2021). Clarifying the efficacy of GCS in preventing PTS among DVT patients would help reduce either patient morbidity or the inconveniences and healthcare costs associated with long-term stocking use (Skervin et al., 2016). While domestic scholarly attention has increasingly focused on risk prediction models and the identification of high-risk populations for PTS (Zhang et al., 2021), there remains a notable lack of systematic real-world data regarding the current utilization of GCS among patients with acute lower extremity DVT at the regional level. This data gap impedes both the evaluation of clinical practice quality and the formulation of targeted intervention strategies.

Therefore, the acquisition of region-specific real-world clinical data is essential for accurately assessing local disease burden and examining the alignment between clinical practice and guideline recommendations (Shi et al., 2023). Consequently, this multicenter prospective study conducted in Anhui Province, China, aims to characterize the clinical profiles, risk factors, and current use of GCS among VTE patients. By providing real-world evidence on the disease spectrum, risk distribution, and secondary prevention practices in this regional population, the findings will inform targeted strategies to improve post-discharge GCS adherence and optimize long-term comprehensive management.

2 Research methodology

2.1 Study population

This multi-center prospective study enrolled hospitalized patients diagnosed with VTE across 13 tertiary general hospitals in Anhui Province, China, between June 2023 and April 2025.

Inclusion criteria

- (1) Age >18 years;
- (2) Diagnosis of DVT confirmed by at least one of the following: venous ultrasound, CT venography, radionuclide venography, or conventional venography;
- (3) Diagnosis of PE confirmed by at least one of the following: CT pulmonary angiography, radionuclide ventilation/perfusion scan, MR pulmonary angi-

ography, or pulmonary angiography;

(4) Provision of written informed consent.

Exclusion criteria

(1) Missing critical baseline clinical data;

(2) Absence of confirmatory imaging for VTE diagnosis performed;

(3) In-hospital mortality;

(4) Unclear classification of VTE type (DVT, PE, or both).

2.2 Data collection

A case report form (CRF) was developed based on literature review and expert panel discussions for systematic data collection. Data encompassed demographic characteristics (e.g., gender, age, height, weight, BMI, smoking and alcohol use history, history of COVID-19 infection, history of VTE), clinical profiles (e.g., comorbidities, use of vascular disease medication, admission for surgical treatment), diagnostic data (e.g., the first available measurements of international normalized ratio [INR], fibrinogen [FIB], D-Dimer, activated partial thromboplastin time [APTT], and platelet count [PLT]). Data regarding GCS usage were collected during follow-up assessments conducted one and two months after discharge.

2.3 Statistical analysis

Statistical analysis was performed using SPSS version 26.0. The normality of continuous variables was assessed with the Shapiro–Wilk test. Variables with a normal distribution were reported as mean $\pm$ standard deviation (Mean $\pm$ SD) and compared be-

tween groups using the independent samples t-test. Non-normally distributed variables were reported as median with interquartile range [Median (IQR)] and analyzed using the Mann–Whitney U test. Categorical variables were summarized as counts and percentages [n (%)] and compared between groups using either the chi-square test or Fisher’s exact test, as appropriate. Multivariate analysis was performed using a binary logistic regression model with the backward (Wald) stepwise method. A two-tailed *P*-value of less than 0.05 was considered statistically significant.

2.4 Ethical considerations

This study was conducted in accordance with the Declaration of Helsinki. Ethical approval was granted by the Ethical Review Committee of a hospital in Eastern China (Approval No. CHEC2023-109). All participants were fully informed of the study purpose and provided written informed consent. The anonymity and confidentiality of all participants were strictly maintained throughout the research process.

3 Results

3.1 General characteristics of VTE patients

A total of 480 patients were initially enrolled, of whom 442 met the inclusion criteria and were included in the final analysis (see Figure 1). The study population comprised 227 males (51.4%) and 215 females (48.6%). The age of the participants ranged from 21 to 98 years, with a mean age of 63.9 ± 14.2 years.

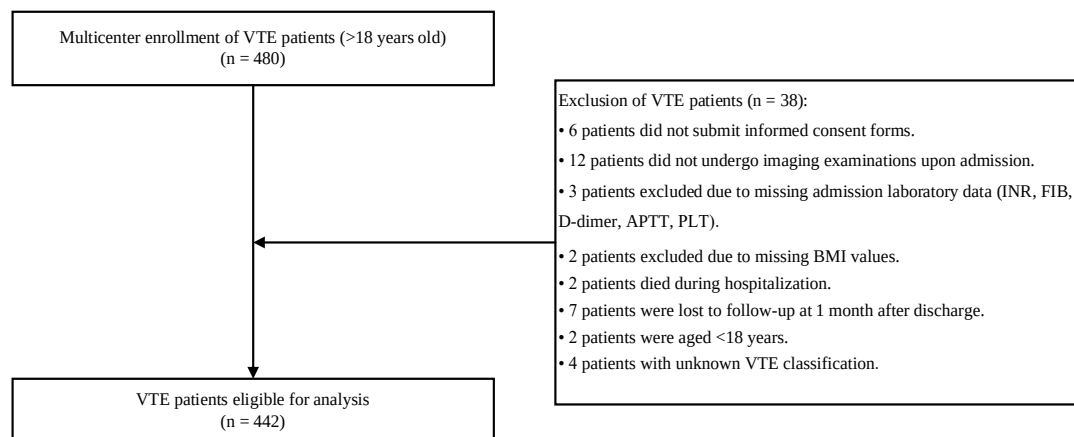


Figure 1 Flowchart of participant enrollment

3.2 Clinical characteristics of VTE patients

Among the study participants, 388 patients (87.8%) and 13 patients (2.9%) were diagnosed DVT or PE alone, respectively; 41 patients (9.3%) were di-

agnosed concurrent DVT and PE. As shown in Table 1, the proportion of pre-existing cardiovascular disease was significantly higher in patients with concurrent DVT and PE compared to those with isolated DVT or PE ($P < 0.05$).

Table 1 Comparative Analysis of Clinical Characteristics in Patients with Isolated VTE versus Concurrent DVT and PE (n = 442)

Variables		Concurrent DVT and PE		X ² /Z	P
		No (n = 401)	Yes (n = 41)		
Gender, n (%)	Male	200 (49.9)	27 (65.9)	3.801	0.051
	Female	201 (50.1)	14 (34.1)		
Age (years), Median (IQR)		66.00 (55.00, 75.00)	62.00 (57.00, 72.50)	-0.024	0.981
BMI (kg/m ²), Median (IQR)		24.30 (22.20, 26.60)	24.20 (22.35, 26.65)	-0.381	0.703
History of smoking, n (%)	No	338 (84.3)	35 (85.4)	0.033	0.856
	Yes	63 (15.7)	6 (14.6)		
History of alcohol, n (%)	No	359 (89.5)	36 (87.8)	0.116	0.733
	Yes	42 (10.5)	5 (12.2)		
History of VTE, n (%)	No	369 (92.0)	39 (95.1)	Fisher	0.757
	Yes	32 (8.0)	2 (4.9)		
History of COVID-19 infection, n (%)	No	207 (51.6)	22 (53.7)	0.062	0.804
	Yes	194 (48.4)	19 (46.3)		
History of vascular disease medication use, n (%)	No	367 (91.5)	36 (87.8)	0.639	0.424
	Yes	34 (8.5)	5 (12.2)		
Admission for surgical treatment, n (%)	No	358 (89.3)	40 (97.6)	Fisher	0.104
	Yes	43 (10.7)	1 (2.4)		
INR*, Median (IQR)		1.02 (0.96, 1.09)	0.99 (0.89, 1.11)	-1.358	0.174
FIB* (g/L), Median (IQR)		3.40 (2.62, 4.37)	3.14 (2.47, 4.42)	-0.628	0.530
D-Dimer* (mg/L), Median (IQR)		5.25 (2.23, 11.49)	6.89 (3.23, 9.82)	-0.735	0.462
APTT* (s), Median (IQR)		30.80 (26.80, 36.90)	30.20 (27.20, 36.40)	-0.144	0.885
PLT* (10 ⁹ /L), Median (IQR)		187.00 (144.50, 231.50)	182.00 (144.50, 252.50)	-0.099	0.921
Hypertension, n (%)	No	289 (72.1)	27 (65.9)	0.705	0.401
	Yes	112 (27.9)	14 (34.1)		
Cancer, n (%)	No	370 (92.3)	35 (85.4)	2.311	0.128
	Yes	31 (7.7)	6 (14.6)		
Diabetes mellitus, n (%)	No	364 (90.8)	34 (82.9)	2.555	0.110
	Yes	37 (9.2)	7 (17.1)		
Cardiovascular disease, n (%)	No	380 (94.8)	33 (80.5)	12.364	<0.001
	Yes	21 (5.2)	8 (19.5)		
Cerebral infarction, n (%)	No	373 (93.0)	37 (90.2)	Fisher	0.524
	Yes	28 (7.0)	4 (9.8)		

* the initial in-hospital measurements

3.3 Risk factors for VTE occurrence

The most common risk factors associated with VTE occurrence include history of COVID-19 infection (n = 213, 48.2%), hypertension (n = 126, 28.5%),

history of smoking (n = 69, 15.6%), obesity (BMI $\geq$ 28.0 kg/m²; n = 64, 14.5%), diabetes mellitus (n = 44, 10.0%), and admission for surgical intervention (n = 44, 10.0%) (Table 2).

Table 2 Risk Factors for VTE occurrence (n = 442)

Risk Factors	Number of cases	Frequency (%)
Obesity (BMI $\geq$ 28.0 kg/m ²)	64	14.5
History of smoking	69	15.6
History of alcohol	47	10.6
History of VTE	34	7.7
History of COVID-19 infection	213	48.2
History of vascular disease medication use	39	8.8
Admission for surgical treatment	44	10.0
Hypertension	126	28.5
Cancer	37	8.4
Diabetes mellitus	44	10.0
Cardiovascular disease	29	6.6
Cerebral infarction	32	7.2

3.4 Use of GCS in patients with lower-extremity DVT after discharge

Among 424 patients diagnosed with lower-extremity DVT, 117 (27.6%) reported using GCS within the first month after discharge. Daily wear time ranged from 3 to 24 hours, with a mean duration of 11.76 ± 3.07 hours per day. At the two-month follow-up, after excluding one death and two patients lost to follow-up, 421 patients were available for analysis.

Among these, 146 patients (34.7%) reported using GCS, with daily wear time ranging from 1 to 18 hours and a mean duration of 10.98 ± 3.02 hours per day.

A total of 421 lower-extremity DVT patients completed the two-month follow-up. Among them, 63.7% never used GCS during the entire period, while only 26.1% used GCS consistently for both months. Adherence patterns changed in 10.3% of patients during follow-up, with 8.6% starting GCS use only in the second month (Table 3).

Table 3 Post-Discharge GCS Use over a Two-Month Period in Patients with Lower Extremity DVT

Categories	Number of cases	Frequency (%)
Never used	268	63.7
Usage limited to the first month only	7	1.7
Usage began in the second month	36	8.6
Consistently used	110	26.1

Univariate analyses were used to identify factors associated with continuous two-month GCS usage after discharge, which revealed significant between-group differences in age, BMI, and history of COVID-19 infection (all $P < 0.05$) (Table 4). These variables were then entered into a binary logistic regression model using backward stepwise selection based on the Wald test. In the final multivariate model, a histo-

ry of COVID-19 infection and BMI remained independent predictors of adherence. Patients with a prior COVID-19 infection were significantly less likely to use GCS persistently ($OR = 0.227$, 95%CI: 0.139-0.370). Each one-unit increase in BMI was associated with a slightly higher likelihood of consistent use ($OR = 1.069$, 95%CI: 1.006-1.136). Age was not retained in the final model (Table 5).

Table 4 Intergroup Comparison of Continuous Two-Month GCS Use After Discharge in Patients with Lower-Extremity DVT (n = 421)

Variables		Continuous Two-Month GCS Use After Discharge		X ² /Z	P
		No (n = 311)	Yes (n = 110)		
Gender, n (%)	Male	164 (52.7)	55 (50.0)	0.243	0.622
	Female	147 (47.3)	55 (50.0)		
Age(years), Median (IQR)		66.00 (56.00, 75.00)	61.50 (51.75, 73.00)	-2.094	0.036

Table 4 Continued.

Variables		Continuous Two-Month GCS Use After Discharge		X ² /Z	P
		No (n = 311)	Yes (n = 110)		
BMI(kg/m ²), Median (IQR)		24.20 (22.00, 26.50)	25.00 (22.90, 27.03)	-2.109	0.035
History of smoking, n (%)	No	259 (83.3)	95 (86.4)	0.578	0.447
	Yes	52 (16.7)	15 (13.6)		
History of alcohol, n (%)	No	276 (88.7)	100 (90.9)	0.398	0.528
	Yes	35 (11.3)	10 (9.1)		
History of VTE, n (%)	No	283 (91.0)	105 (95.5)	2.235	0.135
	Yes	28 (9.0)	5 (4.5)		
History of COVID-19 infection, n (%)	No	188 (60.5)	28 (25.5)	39.834	<0.001
	Yes	123 (39.5)	82 (74.5)		
History of vascular disease medication use, n (%)	No	284 (91.3)	99 (90.0)	0.172	0.678
	Yes	27 (8.7)	11 (10.0)		
Admission for surgical treatment, n (%)	No	280 (90.0)	100 (90.9)	0.071	0.790
	Yes	31 (10.0)	10 (9.1)		
Hypertension, n (%)	No	226 (72.7)	73 (66.4)	1.570	0.210
	Yes	85 (27.3)	37 (33.6)		
Cancer, n (%)	No	285 (91.6)	104 (94.5)	0.977	0.323
	Yes	26 (8.4)	6 (54.5)		
Diabetes mellitus, n (%)	No	283 (91.0)	96 (87.3)	1.255	0.263
	Yes	28 (9.0)	14 (12.7)		
Cardiovascular disease, n (%)	No	291 (93.6)	105 (95.5)	0.517	0.472
	Yes	20 (6.4)	5 (4.5)		
Cerebral infarction, n (%)	No	292 (93.9)	98 (89.1)	2.744	0.098
	Yes	19 (6.1)	12 (10.9)		

Table 5 Multivariate Analysis of Factors Influencing Continuous Two-Month Compression Stocking Use after Discharge in Patients with Lower-Extremity DVT

Variables	B	Standard Error	Wald	P	Exp (B)	95%CI	
						Lower	Upper
BMI	0.067	0.031	4.602	0.032	1.069	1.006	1.136
History of COVID-19 infection	-1.483	0.249	35.482	<0.001	0.227	0.139	0.370
Constant	-2.058	0.783	6.905	0.009	0.128		

4 Discussion

This study analyzed 442 patients with VTE to clarify the distribution patterns and clinical characteristics of different disease subtypes. The results showed that isolated DVT accounted for 87.8% of cases, representing the predominant clinical presentation. Isolated PE was less common (2.9%), while 9.3% of patients exhibited concurrent DVT and PE. This distribution aligns with previous studies (Cowan et al., 2024), confirming the central role of DVT within the spectrum of VTE. Notably, patients with concurrent DVT and PE had a significantly higher prevalence of pre-existing cardiovascular disease. This observation suggests that cardiovascular comorbidities

may not merely coexist with VTE but could serve as potential risk factors promoting thrombus progression from peripheral veins to the pulmonary arteries. Possible mechanisms include endothelial dysfunction, which impairs the anticoagulant properties of the vessel wall; systemic hypercoagulability, which predisposes patients to pathological thrombus formation; and hemodynamic alterations associated with cardiovascular disease, such as venous stasis, which may collectively increase the risk of PE development (Kearon et al., 2016). Further prospective and mechanistic studies are needed to clarify the role of cardiovascular comorbidities in VTE progression and to guide

targeted clinical interventions.

This study identified a history of COVID-19 infection, hypertension, smoking history, obesity, diabetes, and admission for surgical treatment as relatively common risk factors among patients with VTE. In this cohort, a prior history of COVID-19 was present in nearly half of the patients as a risk factor, a finding likely attributable to mechanisms such as SARS-CoV-2-induced endothelial injury, systemic inflammation, and a resultant hypercoagulable state (Secades et al., 2025). Hypertension, as a commonly identified factor, indicates that sustained disruption of vascular endothelial homeostasis may continuously contribute to the development of VTE (Nazarzadeh et al., 2023). Meanwhile, smoking, obesity, and diabetes, all of which are prothrombotic conditions, suggest that metabolic inflammation and insulin resistance likely promote thrombosis by disturbing the coagulation-fibrinolysis balance (Durlach et al., 2022). Although surgical admission represented a relatively low proportion (10.0%) of the cohort, it nevertheless underscores the ongoing importance of perioperative VTE prophylaxis in clinical practice (Emigh et al., 2025). It is important to note that the present analysis is descriptive in design and therefore cannot establish causal relationships or quantify independent risk contributions of the identified factors to VTE development. Thus, these results should be interpreted as characterizing the clinical profile of this VTE cohort rather than providing etiological evidence.

Despite reports of 56%–93% long-term adherence in clinical trials (Skervin et al., 2016), this study demonstrates that real-world adherence to GCS in the first two months post-discharge is substantially lower among patients with lower extremity DVT. Only 26.1% maintained consistent use, whereas 63.7% reported no use at all. This divergence may be explained by two principal distinctions in study design and temporal focus. First, previous evidence derives predominantly from interventional trials that enrolled selected patient cohorts and provided closer follow-up and reinforcement—conditions generally conducive to higher adherence than those in real-world observational settings. Second, the present analysis specifically targeted the early post-discharge adaptation phase, a period during which factors such as device-related discomfort or perceived symptomatic improvement frequently prompt discontinuation, whereas patients

who sustain long-term use likely constitute a subgroup with inherently greater adherence. Consequently, these findings suggest that treatment discontinuation clusters in the immediate post-discharge period, underscoring the necessity of strengthening patient support and intervention strategies during this critical interval to improve sustained adherence.

This study demonstrates that adherence to GCS among patients with lower extremity DVT in home-based settings is not only suboptimal but also characterized by marked temporal variability and behavioral heterogeneity. Even among users, mean daily wear time declined slightly from 11.76 hours in the first month to 10.98 hours in the second month, with substantial interindividual variation ranging from 1 to 18 hours. Although the point prevalence of use increased slightly from 27.6% in the first month to 34.7% in the second month, only a minority of patients sustained consistent use. Furthermore, 10.3% of patients changed their usage patterns during follow-up, exhibiting either delayed initiation or early discontinuation after the first month. These findings collectively suggest that adherence behavior is dynamic and likely influenced by multiple contextual, psychological, and practical factors (Van Hecke, Grypdonck, & Defloor, 2009). Moving forward, strategies should prioritize personalized and adaptive support. Examples include digitally enabled monitoring, tailored behavioral interventions, and targeted assistance during critical transition periods (Maskova et al., 2025; Siebenhofer et al., 2019), all of which may help sustain adherence throughout the rehabilitation continuum.

The present study identified a history of COVID-19 infection as a significant barrier to long-term adherence to GCS among patients with lower-extremity DVT. Patients with a prior COVID-19 infection exhibited a markedly reduced likelihood of persistent GCS use ($OR = 0.227$, 95%CI: 0.139–0.370). The most plausible explanation for this association lies in the post-infection somatic sequelae commonly observed after COVID-19, such as fatigue, asthenia, and decreased exercise tolerance (Al-Aly, Xie, & Bowe, 2021). These symptoms may directly compromise a patient's physical ability and willingness to regularly don and tolerate GCS, which itself requires sustained effort and may induce discomfort. By contrast, BMI demonstrated only minimal predictive value. Each unit increase in BMI was associated with a slightly el-

evated probability of continued GCS use ($OR = 1.069$, 95%CI: 1.006–1.136). Although this association reached statistical significance, its modest magnitude suggests limited clinical relevance. This slight increase in adherence observed among patients with higher BMI may be attributable to their elevated underlying risk of PTS, for which obesity is a well-established risk factor, potentially leading to more noticeable symptoms that reinforce adherence to therapy (Galanaud, Monreal, & Kahn, 2016).

This multicenter, prospective observational study, conducted in Anhui Province, China, was designed to systematically characterize the real-world management of patients with VTE following hospital discharge. The findings provide a realistic depiction of the disease spectrum, risk profile, and current practice of GCS use for secondary prevention among VTE patients in this regional context. These results offer critical local evidence for assessing the disease burden and for examining potential discrepancies between guideline recommendations and clinical practice. However, several limitations should be acknowledged. First, the observational design allows for the identification of associations but precludes the establishment of causal relationships. Second, the two-month follow-up period is insufficient to evaluate certain long-term outcomes, such as PTS. Finally, as a regionally conducted study, caution is warranted when extrapolating these conclusions to other geographical or healthcare settings.

5 Conclusion

This multicenter observational study provides a systematic overview of the disease spectrum, risk distribution, and current utilization of GCS for secondary prevention among patients with VTE in Anhui Province, China. The results indicate that DVT represents the most common clinical manifestation. Patients with concurrent DVT and PE carried a greater burden of cardiovascular comorbidities. A history of COVID-19 infection was identified as a significant risk factor for VTE development. Moreover, long-term adherence to GCS after discharge remained substantially inadequate among patients with lower extremity DVT. Prior COVID-19 infection was found to be a strong independent predictor of poor sustained

GCS use, while BMI showed only a marginal association. These findings offer region-specific evidence that supports clinical practice and health policy formulation. They highlight the need not only to identify PTS high-risk populations and refine secondary prevention strategies, but also to improve the adherence to long-term treatment and strengthen supportive care systems to enhance VTE patients' long-term outcomes.

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Data availability statement

The datasets generated and analysed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Conflict of interest

None declared.

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