Section: Miscellaneous

Original Research Article

INCIDENCE AND DETERMINANTS OF DEEP VENOUS THROMBOSIS AMONG CRITICALLY ILL PATIENTS: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Deep venous thrombosis (DVT) is a common and potentially preventable complication among critically ill patients. Despite routine thromboprophylaxis, many remain at high risk due to immobilization, systemic inflammation, and invasive therapies. This study aimed to determine the incidence of DVT in a critically ill population and to identify clinical and treatment-related risk factors associated with its development.

Materials and Methods: A prospective observational study was conducted in an adult intensive care unit, enrolling 247 patients with an expected ICU stay >48 hours. Baseline demographics, comorbidities, severity scores, interventions, and thromboprophylaxis practices were recorded. All patients underwent bilateral lower-limb Doppler ultrasonography at admission and on day 7, or earlier if clinically indicated. Multivariable logistic regression was used to identify independent predictors of DVT.

Results: The incidence of DVT was 17.4% (43/247). Patients with DVT were older, had higher APACHE II scores, and were more likely to require mechanical ventilation, vasopressors, renal replacement therapy, and prolonged immobilization (all $p < 0.05$). Pharmacologic prophylaxis with LMWH was significantly less common among those who developed DVT. Independent predictors included age ≥60 years (aOR 2.21), APACHE II ≥20 (aOR 2.76), mechanical ventilation (aOR 2.58), vasopressor use (aOR 1.89), renal replacement therapy (aOR 2.34), prolonged immobilization (aOR 3.11), and lack of pharmacologic prophylaxis (aOR 3.82). DVT was associated with longer ICU stay and higher mortality.

Conclusion: DVT remains a significant problem in the ICU despite widespread prophylaxis. A combination of disease severity, immobility, organ support therapies, and underuse of pharmacologic prophylaxis contribute to the elevated risk. Early identification of high-risk patients and optimization of preventative strategies are essential to reducing thrombosis-related morbidity and mortality.

Keywords: Deep venous thrombosis; Critical illness; Thromboprophylaxis; Risk factors; APACHE II.

INTRODUCTION

Deep venous thrombosis (DVT) is a major preventable complication in critically ill patients and contributes substantially to morbidity and mortality in the intensive care unit (ICU).[1] The combination of immobility, systemic inflammation, vascular endothelial injury, and alterations in coagulation results in a markedly increased pro-thrombotic milieu in this population.[2] Reported DVT incidence among ICU patients varies widely, ranging from 10–31% despite the use of standard thromboprophylaxis, highlighting the complex pathophysiology and variability in clinical practices.[3,4]

Critically ill patients frequently fulfil all elements of Virchow's triad, including venous stasis due to prolonged immobilization and sedation, endothelial injury from invasive procedures, and hypercoagulability triggered by sepsis, trauma, pancreatitis, or major surgery.[5] Mechanical ventilation, vasopressor support, renal replacement therapy, and presence of central venous catheters additionally amplify thrombotic risk. Studies have demonstrated that up to 40% of ICU patients may show laboratory evidence of coagulation activation even in the absence of overt thrombotic events.[6]

Despite routine pharmacological prophylaxis, a substantial proportion of patients continue to develop DVT, suggesting that conventional dosing strategies may be inadequate in states of capillary leak, critical illness–induced pharmacokinetic alterations, and obesity.[7] Moreover, patients with contraindications to anticoagulation—such as active bleeding, recent surgery, or severe thrombocytopenia often remain at exceptionally high risk.[8] Under-diagnosis is also a concern; asymptomatic distal and proximal DVTs are frequently missed due to non-specific clinical signs, prompting recommendations for surveillance ultrasonography in selected high-risk cohorts.[9]

Identifying modifiable and non-modifiable risk factors is essential for designing targeted prevention strategies, optimizing prophylaxis, and improving ICU outcomes.[10] Current literature indicates several potential risk determinants, including advanced age, immobility, mechanical ventilation, vasopressor use, high disease severity scores, malignancy, and the presence of central venous catheters.[10,11] However, the relative contribution of these factors varies across settings, and data from low- and middle-income countries remain limited.

In this context, the present study aimed to determine the incidence of DVT among critically ill patients and to evaluate clinical and treatment-related risk factors associated with its development. Generating robust evidence in this area is crucial for improving risk stratification frameworks and guiding institution-specific thromboprophylaxis protocols.

MATERIALS AND METHODS

Study Design and Setting

This study was designed as a prospective observational study conducted in the adult Intensive Care Unit (ICU) of a tertiary-care teaching hospital. The ICU is a multidisciplinary, closed unit with intensivist-led care, admitting medical, surgical, trauma, and sepsis patients. Data collection was carried out over a period of 12 months, from January 2023 to December 2023, ensuring adequate representation of seasonal variation in ICU admissions. The study aimed to determine the incidence of deep venous thrombosis (DVT) among critically ill patients and to identify clinical, demographic, and treatment-related factors associated with its occurrence.

Study Population

All consecutive adult patients aged 18 years or older who were admitted to the ICU and expected to remain under intensive care for more than 48 hours were considered eligible for inclusion. Patients with documented DVT or pulmonary embolism at the time of ICU admission, those receiving therapeutic anticoagulation before admission, individuals with known hypercoagulable states, pregnant women, and patients in whom compression ultrasonography could not be performed were excluded. This ensured a homogenous cohort suitable for evaluating incident DVT developing during the ICU stay rather than pre-existing thrombotic disease.

Sample Size and Sampling Technique

A convenience sampling approach was employed, enrolling all eligible patients during the study period. The sample size was estimated based on an expected ICU-related DVT incidence of approximately 15–25% from previously published data.[12] Using a confidence level of 95% and a precision of 5%, the minimum required sample size was calculated to be approximately 247 patients; however, all patients meeting the inclusion criteria were ultimately recruited to improve statistical power for risk factor analysis.

Data Collection and Variables

Data were collected prospectively using a structured case-record form. Baseline information included demographic variables (age, sex, BMI), comorbidities (diabetes, hypertension, malignancy, chronic kidney disease), primary diagnosis leading to ICU admission, APACHE II or SOFA scores at admission, and pre-ICU mobility status. Treatment-related factors such as mechanical ventilation, vasopressor use, central venous catheter (CVC) placement, renal replacement therapy, sedation status, and type of thromboprophylaxis (pharmacological or mechanical) were recorded throughout the ICU stay. Additional data on immobilization duration, hemodynamic instability, presence of sepsis, and contraindications to anticoagulation were also documented. Laboratory parameters including platelet count, D-dimer, and coagulation profile were measured according to ICU protocols.

Assessment for Deep Venous Thrombosis

All enrolled patients underwent bilateral lower-limb venous Doppler ultrasonography performed by an experienced radiologist or certified sonographer. The initial Doppler evaluation was conducted within the first 48–72 hours of ICU admission to rule out pre-existing thrombosis. Subsequent surveillance ultrasonography was repeated on day 7, and earlier if clinical suspicion for DVT arose, such as unexplained limb swelling, pain, erythema, or increasing D-dimer levels. Standard compression ultrasonography techniques were applied, examining the common femoral, superficial femoral, popliteal, posterior tibial, and peroneal veins. DVT was defined as the presence of non-compressible venous segments with or without visualized intraluminal thrombus.

Thromboprophylaxis Protocol

Thromboprophylaxis was provided according to ICU guidelines and individualized based on bleeding risk. Patients without contraindications received low-molecular-weight heparin (LMWH) or unfractionated heparin in standard prophylactic doses. Mechanical methods, including intermittent pneumatic compression or graduated compression stockings, were used when pharmacologic prophylaxis was contraindicated. Adherence to prophylaxis and any modifications were recorded daily.

Outcome Measures

The primary outcome was the incidence of lower-limb DVT developing during the ICU stay. Secondary outcomes included identification of independent risk factors associated with DVT, timing of thrombus formation, association with thromboprophylaxis adequacy, and clinical outcomes such as ICU length of stay, need for escalation of care, and mortality.

Ethical Considerations

The study was approved by the Institutional Ethics Committee. Written informed consent was obtained from patients or legally authorized representatives prior to enrolment. Confidentiality of patient information was strictly maintained, and all procedures adhered to the ethical principles of the Declaration of Helsinki.

Statistical Analysis

Data were entered into a secure database and analyzed using Statistical Package for Social Sciences (SPSS) version 20.0. Continuous variables were expressed as mean ± standard deviation or median (interquartile range) depending on distribution, assessed using the Shapiro–Wilk test. Categorical variables were summarized as frequencies and percentages. The incidence of DVT was calculated as the proportion of patients developing DVT during the ICU stay. Univariate analyses were conducted using chi-square or Fisher's exact test for categorical variables and independent t-test or Mann–Whitney U test for continuous variables. Variables with $p < 0.20$ on univariate analysis were entered into a multivariable logistic regression model to identify independent predictors of DVT. Strength of association was expressed as adjusted odds ratios (aOR) with 95% confidence intervals. Statistical significance was defined as $p < 0.05$.

RESULTS

Among the 247 critically ill patients included in the study, the mean age was 57.8 ± 15.6 years, with nearly half (47.8%) aged ≥60 years. A total of 161 patients (65.2%) were male. Patients who developed DVT were significantly older (64.2 ± 13.3 vs. 56.3 ± 15.7 years; $p = 0.001$) and had higher BMI (27.3 ± 4.9 vs. 25.6 ± 4.5 kg/m²; $p = 0.03$) compared with those without DVT. Comorbidities such as diabetes, hypertension, CKD, and malignancy were more frequent among DVT cases but did not reach statistical significance. The mean APACHE II score was higher in the DVT group (22.1 ± 6.9 vs. 17.4 ± 6.2; $p < 0.001$), indicating greater illness severity [Table 1].

Table 1: Baseline Demographic and Clinical Characteristics of ICU Patients (N = 247).

Variable	Total (N=247)	DVT Present (n=43)	DVT Absent (n=204)	p-value
	Frequency (%)/mean ± SD			
Age (years)	57.8 ± 15.6	64.2 ± 13.3	56.3 ± 15.7	0.001
Age group				
< 60 years	129 (52.2%)	13 (30.2%)	116 (56.9%)	0.002
≥ 60 years	118 (47.8%)	30 (69.8%)	88 (43.1%)	
Gender				
Female	86 (34.8%)	13 (30.2%)	73 (35.8%)	0.480
Male	161 (65.2%)	30 (69.8%)	131 (64.2%)	
BMI (kg/m²)	25.9 ± 4.6	27.3 ± 4.9	25.6 ± 4.5	0.030
Comorbidities				
Diabetes Mellitus	108 (43.7%)	23 (53.5%)	85 (41.7%)	0.140
Hypertension	112 (45.3%)	22 (51.2%)	90 (44.1%)	0.400
Chronic Kidney Disease	26 (10.5%)	7 (16.3%)	19 (9.3%)	0.180
Malignancy	14 (5.7%)	5 (11.6%)	9 (4.4%)	0.060
Sepsis on admission	132 (53.4%)	27 (62.8%)	105 (51.4%)	0.160
APACHE II Score	18.3 ± 6.7	22.1 ± 6.9	17.4 ± 6.2	<0.001

BMI – Body Mass Index; CKD – Chronic Kidney Disease; APACHE II – Acute Physiology and Chronic Health Evaluation II; SD – Standard Deviation.

ICU interventions were more intensive among patients who developed DVT. Mechanical ventilation was required in 86.0% of the DVT group compared with 66.7% of the non-DVT group ($p = 0.010$), and the duration of ventilation was significantly longer (median 10 vs. 5 days; $p < 0.001$). Vasopressor use (69.8% vs. 50.0%; $p = 0.020$) and renal replacement therapy (23.3% vs. 10.3%; $p = 0.02$) were also more common among DVT cases. Prolonged immobilization (>7 days) occurred in 58.1% of DVT patients versus 32.8% without DVT ($p = 0.002$). D-dimer levels were significantly higher in patients with DVT (median 2150 vs. 1530 ng/mL; $p = 0.001$), while platelet counts showed a non-significant declining trend [Table 2].

Table 2: ICU Interventions and Clinical Course.

Variable	Total (N=247)	DVT Present (n=43)	DVT Absent (n=204)	p-value
	Frequency (%)/median (IQR)/mean ± SD			
Mechanical Ventilation	173 (70.0%)	37 (86.0%)	136 (66.7%)	0.010
Duration of MV (days)	6 (3–10)	10 (7–13)	5 (3–9)	<0.001
Vasopressor Use	132 (53.4%)	30 (69.8%)	102 (50.0%)	0.020
Central Venous Catheter	189 (76.5%)	37 (86.0%)	152 (74.5%)	0.110
Renal Replacement Therapy	31 (12.6%)	10 (23.3%)	21 (10.3%)	0.020
Sedation >72 hours	87 (35.2%)	21 (48.8%)	66 (32.4%)	0.040
Prolonged Immobilization (>7 days)	92 (37.2%)	25 (58.1%)	67 (32.8%)	0.002
Mean Platelet Count (×10⁹/L)	212 ± 92	188 ± 84	218 ± 93	0.060
D-dimer (ng/mL)	1610 (980–2420)	2150 (1680–3120)	1530 (920–2310)	0.001

MV – Mechanical Ventilation; IQR – Interquartile Range; CVC – Central Venous Catheter; RRT – Renal Replacement Therapy.

Thromboprophylaxis practices showed notable differences between groups. Overall, 93.5% of patients received some form of prophylaxis, but pharmacological prophylaxis with LMWH was significantly less common among those who developed DVT (65.1% vs. 83.3%; p = 0.005). Mechanical prophylaxis alone was used more frequently in DVT patients (25.6% vs. 10.8%; p = 0.010). Contraindications to anticoagulation were also higher in the DVT group (20.9% vs. 9.8%; p = 0.040). The median time to DVT detection was 8 days (IQR 5–11), indicating predominance of hospital-acquired thrombosis rather than early-onset disease [Table 3].

Table 3: Thromboprophylaxis and DVT Incidence.

Variable	Total (N=247)	DVT Present (n=43)	DVT Absent (n=204)	p-value
	Frequency (%)/median (IQR)			
Any Thromboprophylaxis	231 (93.5%)	36 (83.7%)	195 (95.6%)	0.008
LMWH prophylaxis	198 (80.2%)	28 (65.1%)	170 (83.3%)	0.005
Mechanical prophylaxis only	33 (13.4%)	11 (25.6%)	22 (10.8%)	0.010
Contraindication to anticoagulation	29 (11.7%)	9 (20.9%)	20 (9.8%)	0.040
Median time to DVT detection (days)	—	8 (5–11)	—	—

LMWH – Low-Molecular-Weight Heparin.

Multivariable logistic regression identified several independent predictors of DVT in critically ill patients. Age ≥60 years (aOR 2.21; p = 0.020), APACHE II score ≥20 (aOR 2.76; p = 0.003), and mechanical ventilation (aOR 2.58; p = 0.030) were strong clinical predictors. Treatment-related variables such as vasopressor use (aOR 1.89; p = 0.047), need for renal replacement therapy (aOR 2.34; p = 0.049), and lack of pharmacologic prophylaxis (aOR 3.82; p = 0.004) were significantly associated with DVT. Prolonged immobilization (>7 days) emerged as a prominent risk factor (aOR 3.11; p = 0.001) [Table 4].

Table 4: Multivariable Logistic Regression for Predictors of DVT.

Variable	Adjusted Odds Ratio (aOR)	95% CI	p-value
Age ≥60 years	2.21	1.13–4.32	0.020
APACHE II ≥20	2.76	1.40–5.44	0.003
Mechanical Ventilation	2.58	1.08–6.12	0.030
Vasopressor Use	1.89	1.01–3.55	0.047
Renal Replacement Therapy	2.34	1.00–5.46	0.049
Lack of pharmacologic prophylaxis	3.82	1.55–9.41	0.004
Prolonged Immobilization (>7 days)	3.11	1.60–6.05	0.001

aOR – Adjusted Odds Ratio; CI – Confidence Interval.

DVT was associated with significantly poorer clinical outcomes. Patients with DVT had longer ICU stays (median 14 vs. 9 days; p < 0.001) and prolonged hospitalization (21 vs. 15 days; p < 0.001). The proportion requiring mechanical ventilation for more than 7 days was nearly double in the DVT group (65.1% vs. 35.8%; p < 0.001). ICU mortality (41.9% vs. 25.0%; p = 0.020) and in-hospital mortality (51.2% vs. 30.9%; p = 0.009) were significantly higher among patients who developed DVT, underscoring its strong association with adverse outcomes [Table 5].

Table 5: Clinical Outcomes Associated with DVT.

Outcome	DVT Present (n=43)	DVT Absent (n=204)	p-value
	Frequency (%)/median (IQR)		
ICU Length of Stay (days)	14 (10–18)	9 (6–13)	<0.001
Hospital Length of Stay (days)	21 (16–27)	15 (11–22)	<0.001
Need for Mechanical Ventilation >7 days	28 (65.1%)	73 (35.8%)	<0.001
ICU Mortality	18 (41.9%)	51 (25.0%)	0.02
In-hospital Mortality	22 (51.2%)	63 (30.9%)	0.009

ICU – Intensive Care Unit; IQR – Interquartile Range.

DISCUSSION

In this prospective study of 247 critically ill patients, the incidence of deep venous thrombosis was 17.4%, which lies within the range reported in international ICU cohorts (10–31%) and is comparable to Asian studies by Tan et al., and Wang et al., reporting incidence between 14% and 22% despite thromboprophylaxis.[13,14] This underscores the persistent burden of venous thromboembolism (VTE) in ICU settings even with adherence to prophylactic protocols. Similar to the findings of Sinsakolwat et al., and Gratz et al., our study demonstrates that standard thromboprophylaxis may be insufficient in a subset of high-risk patients due to critical illness related physiological alterations.[15,16]

Advanced age emerged as a significant risk factor, with patients aged ≥60 years showing over twice the odds of developing DVT (aOR 2.21). Age-related endothelial dysfunction, increased coagulation factor concentrations, and venous valvular incompetence likely contribute to this heightened risk.[17] This observation aligns with studies by Akrivou et al., and Vostatek et al., where aging is consistently identified as a dominant predictor of VTE.[18,19]

Illness severity, reflected by higher APACHE II scores, showed a strong association with DVT development (aOR 2.76). Severe illness amplifies systemic inflammation, induces endothelial injury, and promotes a hypercoagulable state.[20] Similar correlations between higher severity scores and increased VTE risk have been reported by Gao et al., and Zhang et al., reinforcing the concept that thrombosis in ICU patients is a direct consequence of the pathobiology of critical illness rather than merely reduced mobility.[21,22]

Mechanical ventilation and prolonged ventilator dependence were significantly more common among DVT cases in our study (86% vs. 66.7%), consistent with work by Malato et al., who identified respiratory failure and positive pressure ventilation as independent contributors to venous stasis and reduced calf muscle pump activity.[23] In our cohort, median duration of ventilation was 10 days in the DVT group, highlighting immobility as a crucial modifiable factor.

Vasopressor use and renal replacement therapy (RRT) were also significant predictors of DVT. Vasopressors contribute to peripheral vasoconstriction, reduced venous flow, and endothelial hypoxia, potentiating thrombosis.[24] The association between RRT and DVT may reflect both the severity of underlying illness and catheter-related endothelial injury.[24] Previous studies, including the multicenter study by Malato et al., Girardi et al., and Evans et al., have similarly identified vasopressor use and organ support therapies as markers of heightened thrombotic risk.[23,25,26]

Prolonged immobilization (>7 days) demonstrated one of the strongest associations (aOR 3.11), reinforcing the classical component of venous stasis in Virchow's triad.[27] Comparable findings were reported in the Pugliese et al., and PREVENT cohorts in Al-Dorzi et al., where immobility duration strongly predicted both distal and proximal DVT.[27,28] The high D-dimer levels observed among DVT patients in our study further validate ongoing coagulation activation and thrombus formation.[28]

A particularly relevant finding for clinical practice is the markedly higher risk of DVT among patients who did not receive pharmacologic prophylaxis (aOR 3.82). Even though 93.5% of patients received some form of thromboprophylaxis, those managed with mechanical methods alone had significantly higher DVT rates, echoing results from the PREVENT cohorts in Al-Dorzi et al., where pharmacologic prophylaxis was superior to mechanical devices.[28] This highlights the need for careful reassessment of contraindications, dose adjustments in obese or edematous patients, and early initiation of anticoagulation whenever feasible.[28]

Finally, the development of DVT was associated with significantly worse clinical outcomes in our cohort, including longer ICU stay (14 vs. 9 days), higher ICU mortality (41.9% vs. 25%), and increased in-hospital mortality (51.2% vs. 30.9%). These observations align with prior Permpikul et al., Liu et al., and Yang et al., demonstrating a 1.5–2-fold increase in mortality among critically ill patients with VTE, reflecting the cumulative effects of systemic inflammation, immobilization, organ failure, and thrombus-related complications.[29-31]

Overall, our study reaffirms that DVT in critically ill patients is multifactorial—rooted in a complex interaction of inflammation, endothelial dysfunction, immobility, invasive devices, and suboptimal prophylaxis. These findings underscore the need for enhanced risk stratification, early mobilization strategies, optimization of anticoagulant dosing, and consideration of routine surveillance imaging in selected high-risk subgroups.

Limitations

Despite these strengths, the study was conducted at a single center, which may limit broader applicability to different healthcare settings. Ultrasound screening was limited to the lower limbs and did not include upper-limb or catheter-associated DVT, potentially underestimating overall thrombotic burden. Although confounders were adjusted for, unmeasured variables such as genetic thrombophilia or precise anticoagulation dosing variations may have influenced the observed associations. Lastly, long-term outcomes beyond hospital discharge were not assessed.

CONCLUSION

In this prospective study of critically ill patients, the incidence of deep venous thrombosis was substantial despite widespread use of thromboprophylaxis, underscoring the persistent thrombotic burden in the ICU. Advanced age, higher illness severity,

mechanical ventilation, vasopressor use, renal replacement therapy, prolonged immobilization, and lack of pharmacological prophylaxis emerged as significant independent predictors of DVT. These findings highlight the complex interplay of systemic inflammation, venous stasis, and endothelial injury that characterizes thrombotic risk in critical illness. Strengthening early risk stratification, optimizing anticoagulation strategies, and promoting mobility may help reduce the incidence of DVT and improve clinical outcomes in this vulnerable population.

REFERENCES

1. Miri M, Goharani R, Sistanizad M. Deep Vein Thrombosis among Intensive Care Unit Patients; an Epidemiologic Study. Emerg (Tehran). 2017;5(1):e13.
2. Zhu J, Bouzid R, Travert B, et al. Combined coagulation and inflammation markers as predictors of venous thromboembolism and death in COVID-19. Front Med (Lausanne). 2024;11:1399335.
3. Minet C, Potton L, Bonadona A, et al. Venous thromboembolism in the ICU: main characteristics, diagnosis and thromboprophylaxis. Crit Care. 2015;19(1):287.
4. Boddi M, Peris A. Deep Vein Thrombosis in Intensive Care. Adv Exp Med Biol. 2017;906:167-181.
5. Bande BD, Bande SB, Mohite S. The hypercoagulable states in anaesthesia and critical care. Indian J Anaesth. 2014;58(5):665-671.
6. Heinrich F, Roedl K, Jarczak D, et al. New Insights in the Occurrence of Venous Thromboembolism in Critically Ill Patients with COVID-19-A Large Postmortem and Clinical Analysis. Viruses. 2022;14(4):811.
7. Ramakrishnan N, Detect-Dvt Investigators. Prophylaxis and Incidence of Symptomatic Deep Vein Thrombosis in Indian Patients with Sepsis: DETECT-Deep Vein Thrombosis Registry. Indian J Crit Care Med. 2017;21(11):765-771.
8. Patell R, Zwicker JI. Evidence-Based Minireview: Full dose, modified dose, or no anticoagulation for patients with cancer and acute VTE and thrombocytopenia. Hematology Am Soc Hematol Educ Program. 2022;2022(1):312-315.
9. Zhang Y, Xia H, Wang Y, et al. The rate of missed diagnosis of lower-limb DVT by ultrasound amounts to 50% or so in patients without symptoms of DVT: A meta-analysis. Medicine (Baltimore). 2019;98(37):e17103.
10. Sendagire C, Pisani L, Nuwagira A, et al. Potentially MOdifiable factors To ImproVe outcomes of mechanically Ventilated patients in a low-income country Intensive Care Units (MOTIVATE-ICU): rationale and protocol for a registry-embedded prospective observational study. Crit Care Sci. 2025;37:e20250273.
11. Wilasrusmee C, Kiranantawat K, Horsirimanont S, et al. Deep venous thrombosis in surgical intensive care unit: prevalence and risk factors. Asian J Surg. 2009;32(2):85-88.
12. Kumar A, Mehta Y, Ali T, Gupta MK, George JV. Deep vein thrombosis in medical and surgical Intensive Care Unit patients in a Tertiary Care Centre in North India: Incidence and risk factors. J Anaesthesiol Clin Pharmacol. 2017;33(2):181-186.
13. Tan SJJ, Tan EK, Ng YYR, et al. Venous thromboembolism among Asian populations with localized colorectal cancer undergoing curative resection: is pharmacological thromboprophylaxis required? A systematic review and meta-analysis. Ann Coloproctol. 2024;40(3):200-209.
14. Wang KL, Yap ES, Goto S, Zhang S, Siu CW, Chiang CE. The diagnosis and treatment of venous thromboembolism in asian patients. Thromb J. 2018;16:4.
15. Sinsakolwat P, Trongtrakul K, Tajarernmuang P, et al. Risk-adapted venous thromboembolism prophylaxis in Asian patients admitted to medical intensive care unit: a prospective controlled trial. Thromb J. 2025;23(1):106.
16. Gratz J, Wiegele M, Maleczek M, et al. Risk of Clinically Relevant Venous Thromboembolism in Critically Ill Patients With COVID-19: A Systematic Review and Meta-Analysis. Front Med (Lausanne). 2021;8:647917.
17. Castro-Ferreira R, Cardoso R, Leite-Moreira A, Mansilha A. The Role of Endothelial Dysfunction and Inflammation in Chronic Venous Disease. Ann Vasc Surg. 2018;46:380-393.
18. Akrivou D, Perlepe G, Kirgou P, Gourgoulianis KI, Malli F. Pathophysiological Aspects of Aging in Venous Thromboembolism: An Update. Medicina (Kaunas). 2022;58(8):1078.
19. Vostatek R, Ay C. Biological Aging and Venous Thromboembolism: A Review of Telomeres and Beyond. Biomedicines. 2024;13(1):15.
20. Tian F, Lu Y, Liu X, et al. Relationship Between the Systemic Immune-Inflammation Index and Deep Venous Thrombosis After Spinal Cord Injury: A Cross-Sectional Study. J Inflamm Res. 2024;17:8325-8334.
21. Gao X, Zeng L, Wang H, et al. Prevalence of Venous Thromboembolism in Intensive Care Units: A Meta-Analysis. J Clin Med. 2022;11(22):6691.
22. Zhang L, Chen F, Hu S, et al. External Validation of the ICU-Venous Thromboembolism Risk Assessment Model in Adult Critically Ill Patients. Clin Appl Thromb Hemost. 2024;30:10760296241271406.
23. Malato A, Dentali F, Siragusa S, et al. The impact of deep vein thrombosis in critically ill patients: a meta-analysis of major clinical outcomes. Blood Transfus. 2015;13(4):559-568.
24. Neyra JA, Echeverri J, Bronson-Lowe D, Plopper C, Harenski K, Murugan R. Association of vasopressor use during renal replacement therapy and mortality. J Crit Care. 2025;89:155103.
25. Girardi L, Di Nisio M, Candeloro M, Valeriani E, Ageno W. Catheter-related deep vein thrombosis: Where are we at and where are we going? Updates and ongoing unmet clinical needs. Eur J Clin Invest. 2025;55(1):e14311.
26. Evans NS, Ratchford EV. Catheter-related venous thrombosis. Vasc Med. 2018;23(4):411-413.
27. Pugliese ME, Battaglia R, Ursino M, et al. Prevalence and Risk Factors of Deep Venous Thrombosis in Intensive Inpatient Neurorehabilitation Unit. Healthcare (Basel). 2024;12(9):936.
28. Al-Dorzi HM, AlQahtani S, Al-Dawood A, et al. Association of early mobility with the incidence of deep-vein thrombosis and mortality among critically ill patients: a post hoc analysis of PREVENT trial. Crit Care. 2023;27(1):83.
29. Permpikul C, Chaiyasoot W, Panitchote A. Incidence of proximal deep vein thrombosis in medical critical care patients. Thromb J. 2022;20(1):5.
30. Liu Z, Liu D, Guo ZN, et al. Incidence and Risk Factors of Lower-Extremity Deep Vein Thrombosis After Thrombolysis Among Patients with Acute Ischemic Stroke. Pharmgenomics Pers Med. 2021;14:1107-1114.
31. Yang Y, Chen D, Bhaskar SMM. Incidence, Risk Factors, and Prevention of Deep Vein Thrombosis in Acute Ischemic Stroke Patients (IRIS-DVT Study): A Systematic Review and Meta-Analysis. Clinical Translational Neuroscience. 2025;9(4):49.