

DEEP VEIN THROMBOSIS (DVT) RISK ASSESSMENT AND MANAGEMENT COMPLIANCE AMONG NURSES IN CRITICAL CARE UNITS: A CLINICAL AUDIT

Mr. Prasad R. Shinde

1st Year M.Sc. Nursing (Nurse Practitioner in Critical Care)

Department of Nursing

MGM New Bombay College of Nursing, MGM IHS, Kamothe, Navi Mumbai, India

Mrs. Sarika Suresh Nair

Associate Professor

Department of M.Sc. Nursing (Medical Surgical Nursing)

MGM New Bombay College of Nursing, MGM IHS, Kamothe, Navi Mumbai, India

Abstract : DVT (deep vein thrombosis) is one of the most preventable causes of morbidity and mortality in critically ill patients admitted to intensive care units. Nurses play a critical role in the timely assessment and reassessment of DVT risk, administration of thromboprophylaxis, patient education, and documentation. However, when evidence-based DVT prevention measures are not implemented appropriately, preventable complications may arise. The present clinical audit was conducted to determine the compliance of nurses with DVT risk assessment, reassessment, and management in the critical care units of a selected tertiary care teaching hospital. A quantitative descriptive clinical audit design was employed. Using total enumeration sampling, the study comprised 100 Registered Nurses working in selected critical care units. Two validated structured observational checklists on DVT Risk Assessment and DVT Management practices were used to collect data. Descriptive and inferential statistics were used for data analysis. Overall findings showed that the mean compliance score for DVT Risk Assessment and Reassessment was 64.4% (Partially Compliant) and for DVT Management was 61.3% (Partially Compliant). For DVT Risk Assessment and Reassessment, 26.0% of nurses were Fully Compliant, 29.0% were Partially Compliant, and 45.0% were Non-Compliant; for DVT Management, 14.0% were Fully Compliant, 32.0% were Partially Compliant, and 54.0% were Non-Compliant. Significant problems with scoring accuracy, mechanical prophylaxis, documentation, and communication were identified. The study found a statistically significant association between participation in DVT-related training and workshop attendance and nurses' level of compliance. The study identified a significant deficiency in thromboprophylaxis practice among nursing personnel working in ICUs. Organising education through structured programmes and competency-based training, establishing and maintaining standardised protocols, implementing electronic documentation systems, and conducting regular audits can enhance compliance and reinforce patient safety in critical care environments.

Keywords — Deep Vein Thrombosis, Clinical Audit, Compliance, Critical Care Nurses, Thromboprophylaxis, Risk Assessment.

I. INTRODUCTION

Venous thromboembolism (VTE) is one of the most frequent preventable causes of in-hospital morbidity and mortality globally; this includes Deep Vein Thrombosis (DVT) and pulmonary embolism (PE) ¹. Critically ill patients admitted to intensive care units (ICUs) face an elevated risk for VTE due to prolonged immobilisation, sedation, invasive vascular devices, surgery, and hypercoagulable states associated with critical illness ².

Although evidence-based guidelines and prophylactic measures are available to prevent DVT, clinical practice remains inconsistent with these guidelines ³. Failure to identify high-risk patients and administer optimal prophylaxis may lead to a greater number of days in the ICU, prolonged hospital admissions, pulmonary embolism, higher healthcare costs, and death.

The ability of nurses to continuously monitor patients at the bedside, perform DVT risk assessment, apply mechanical prophylaxis, administer pharmacological prophylaxis, educate patients and their families, and document activities makes them central to this prevention process. Nurses' adherence to DVT prevention guidelines may therefore have a direct impact on patient safety outcomes.

Previous studies conducted internationally have reported a significant lack of knowledge and practice regarding DVT prevention among nurses ⁴. Key challenges affecting compliance include the absence of standardised protocols, inadequate documentation systems, educational deficits, insufficient staffing, and lack of institutional training.

The knowledge and compliance of Indian intensive care nurses regarding DVT risk assessment and management are limited. Thus, the present clinical audit was conducted to assess the compliance rates among nurses in the critical care units of a tertiary care teaching hospital.

OBJECTIVES

1. To assess the compliance of nurses with DVT risk assessment and reassessment in critical care units.
2. To identify the compliance of nurses with DVT management practices in critical care units.

II. REVIEW OF LITERATURE

Despite advances in thromboembolism prophylaxis, critically ill patients remain highly susceptible to VTE. ICU admission, prolonged immobilisation, mechanical ventilation, invasive devices, and critical illness have been identified as major risk factors for DVT across multiple studies ².

DVT prophylaxis compliance has been found to be suboptimal across international healthcare settings. The ENDORSE study, a multinational survey conducted across 32 countries, reported poor adherence to evidence-based thromboprophylaxis guidelines in at-risk medical patients, with only 39.5% receiving the recommended treatment ³.

The lack of knowledge and practices of DVT prevention among nurses have been described in various studies. According to Al-Mugheed and Bayraktar⁴, although attitudes of nurses towards the practice of thromboprophylaxis were positive, the level of DVT prevention practice across the globe was found to be quite low. In the same vein, Alyousef et al.⁵ found that there were gaps in the knowledge of nurses in assessing and preventing DVT.

Studies show that nursing compliance is also significantly improved through educational interventions. Gibbs et al.⁶ reported that a nurse-directed audit and feedback intervention significantly improved thromboprophylaxis compliance. Hu et al.⁷ also demonstrated that structured DVT education positively improved nurses' knowledge, attitudes, and preventive behaviours.

Research in the ICU has identified mechanical prophylaxis implementation, documentation, and communication as additional challenges. Guan et al.⁸ found that ICU nurses' knowledge of compression devices and mechanical prophylaxis techniques was inadequate. Wu et al.⁹ demonstrated that audit-based interventions enhance compliance with DVT prevention protocols and improve patient safety outcomes.

The reviewed literature emphasizes the importance of prevention of DVT as one of the greatest patient safety issues in critical care environments and reinforces the need for an institutional audit in order to assess gaps in compliance and adopt best practice nursing.

III. MATERIALS AND METHODS

Study Design

A quantitative descriptive clinical audit design was employed for conducting the study.

Study Setting

The study was conducted in the critical care units of a tertiary care teaching hospital. The units included:

Medical Intensive Care Unit (MICU)

Surgical Intensive Care Unit (SICU)

Emergency Medical Surgical ICU (EMSICU)

Cardiovascular Thoracic Surgery ICU (CVTSICU)

Other Critical Care Units

Population and Sample

All registered nurses deployed in the critical care units of the selected hospital were included as the study population.

Inclusion Criteria

Registered nurses (GNM/B.Sc. Nursing/P.B.B.Sc./M.Sc. Nursing) deployed in the specified critical care units.

Nurses with a minimum of three months of experience in the ICU setting at the time of data collection.

- Nurses available for observation during the data collection period.
- Nurses willing to participate and who provide informed consent.

Exclusion Criteria

Nurses who are students or intern nurses

- Nurses on temporary duty
- Nurses who are on leave, off duty, or unavailable during the data collection period.
- Nurses not willing to participate in the study.

The study population comprised 100 ICU nurses, all of whom were included in the sample using total enumeration sampling.

Data Collection Tools

Two validated structured observational checklists were used.

Data Collection Tool 1: Sociodemographic Characteristics of Nurses and Structured Observational Checklist

This structured observational audit checklist was self-developed by the investigator following a review of literature, consultation with critical care experts, and development of a blueprint. The tool was submitted to 10 experts from various fields including critical care nursing, medical-surgical nursing, and medicine for content validity. Based on expert feedback, the tool was refined and finalized. The checklist assessed:

- Patient identification and documentation
- Completion of DVT risk assessment tool
- Scoring accuracy
- Reassessment practices
- Compliance with prophylaxis
- Documentation and accountability

Data Collection Tool 2: Structured Observational Checklist to Assess Nurses' Compliance with DVT Management

This checklist assessed:

Mechanical prophylaxis

Pharmacological management

Patient education and safety

Documentation and communication

The tools demonstrated good inter-rater reliability ($r = 0.88$).

Data Collection Procedure

Data were collected from March 9 to March 30, 2025, through direct observation and record review during routine nursing duties.

Ethical Considerations

Appropriate ethical approval from the Institutional Ethics Committee of the institution was taken for conducting the study.

Statistical Analysis

SPSS Software (Version 26) was used for data analysis. The following descriptive statistics were used: frequency, percentages, mean and standard deviation. Chi-square test was used to measure the association between compliance and the socio-demographic characteristics. P-values < 0.05 were considered statistically significant.

IV. RESULTS

Table 1: Distribution of Staff Nurses Based on Socio-Demographic Characteristics

(n=100)

Socio-Demographic Variable	Category	Frequency (f)	Percentage (%)
Age (Years)	20–25 Years	45	45.0
	26–30 Years	30	30.0
	31–35 Years	18	18.0
	>35 Years	7	7.0
Gender	Male	15	15.0
	Female	85	85.0
Highest Nursing Qualification	Diploma	30	30.0
	Bachelor	64	64.0
	Master	6	6.0
Total Years of Nursing Experience	Less than 1 Year	30	30.0
	1–5 Years	35	35.0
	6–10 Years	22	22.0
	More than 10 Years	13	13.0
Years of Experience in Critical Care	Less than 1 Year	35	35.0
	1–5 Years	32	32.0

Socio-Demographic Variable	Category	Frequency (f)	Percentage (%)
Current Unit	6–10 Years	20	20.0
	More than 10 Years	13	13.0
	MICU	25	25.0
	EMSICU	25	25.0
	CVTSICU	17	17.0
	SICU	25	25.0
	Other	8	8.0
Previous Training on DVT Prevention	Yes	22	22.0
	No	78	78.0
Attendance of DVT-related Workshop	Yes	18	18.0
	No	82	82.0

The results showed that most nurses working in the critical care units were young with little or no ICU-specific experience. The majority of participants were female with undergraduate nursing qualifications. A key deficiency identified during this audit was the absence of formal educational programmes on DVT prevention for nurses. The results suggest that the lack of focused DVT education may contribute to low compliance with evidence-based thromboprophylaxis practices in the ICU.

Compliance with DVT Risk Assessment and Reassessment

Table 2: Distribution of Nurses Based on Overall Compliance with DVT Risk Assessment and Reassessment

(n=100)

Compliance Level	Criteria	Frequency (f)	Percentage (%)
Fully Compliant	≥80%	26	26.0
Partially Compliant	60–79%	29	29.0
Non-Compliant	<60%	45	45.0

Table 3: Distribution of Nurses Based on Categorical Variables of Compliance with DVT Risk Assessment and Reassessment in Critical Care Units

(n=100)

Domain	Compliant (%)	Non-Compliant (%)	Compliance Level
Patient Identification & Documentation	65.2	31.1	Partially Compliant
Completion of DVT Risk Assessment Tool	65.3	31.9	Partially Compliant
Scoring Accuracy	58.6	39.5	Non-Compliant
DVT Reassessment Practices	66.3	32.8	Partially Compliant
Compliance with Recommended Prophylaxis	66.7	23.5	Partially Compliant

Domain	Compliant (%)	Non-Compliant (%)	Compliance Level
Documentation & Accountability	62.0	36.3	Partially Compliant

Overall compliance with DVT Risk Assessment and Reassessment was found to be partially satisfactory among the ICU nurses studied. Large gaps in scoring accuracy, reassessment practices, and record-keeping were observed. Many nurses were unable to accurately calculate the DVT risk score or document patient risk categories. The results suggest a need for competency-based training programmes and improved institutional monitoring systems to ensure accurate thromboprophylaxis assessment practices.

Compliance with DVT Management

Table 4: Distribution of Nurses Based on Overall Compliance with DVT Management

(n=100)

Compliance Level	Criteria	Frequency (f)	Percentage (%)
Fully Compliant	≥80%	14	14.0
Partially Compliant	60–79%	32	32.0
Non-Compliant	<60%	54	54.0

Table 5 : Distribution of Nurses Based on Item-Wise Compliance — Mechanical Prophylaxis and Pharmacological Management, DVT Management

(n=100)

Domain	Compliance Percentage	Compliance Level
Mechanical Prophylaxis	60.1%	Non-Compliant
Pharmacological Management	61.4%	Partially Compliant
Patient Education & Safety	64.6%	Partially Compliant
Documentation & Communication	59.8%	Non-Compliant

The results indicated that DVT Management compliance was lower than DVT Risk Assessment compliance. The lowest performance was observed in mechanical prophylaxis practices and documentation procedures. Common gaps were identified in compression stocking application, skin integrity assessment, and documentation and communication. These gaps may result in poorer patient outcomes and preventable thromboembolic complications in critically ill patients.

Table 6: Association of DVT Risk Assessment and Reassessment Compliance with Socio-Demographic Variables

(n=100)

Variable	χ^2 Value	p-value	Significance (p<0.05)
Age	3.170	0.787	NS
Gender	3.423	0.181	NS
Qualification	1.056	0.901	NS
Nursing Experience	3.149	0.790	NS
ICU Experience	5.365	0.498	NS
Current Unit	4.414	0.818	NS

Variable	χ^2 Value	p-value	Significance (p<0.05)
Previous DVT Training	25.950	<0.001	Significant
DVT Workshop Attendance	32.860	<0.001	Significant

Table 7 : Association of DVT Management Compliance with Socio-Demographic Variables

(n=100)

Variable	χ^2 Value	p-value	Significance (p<0.05)
Age	3.949	0.684	NS
Gender	5.754	0.056	NS
Qualification	2.627	0.622	NS
Nursing Experience	7.095	0.312	NS
ICU Experience	8.869	0.181	NS
Current Unit	5.104	0.746	NS
Previous DVT Training	35.563	<0.001	Significant
DVT Workshop Attendance	25.958	<0.001	Significant

The study demonstrated that prior DVT training and workshop attendance were statistically significantly associated with compliance levels. Structured educational exposure led to better outcomes among nurses in both DVT Risk Assessment and Management practices. Associations between other demographic variables such as age, sex, educational qualification, and years of experience — and compliance were not statistically significant. These findings highlight the need for targeted, competency-based DVT training, independent of general clinical experience.

V. DISCUSSION

This clinical audit examined nurses' compliance with DVT risk assessment and management across five critical care units of a tertiary care teaching hospital. Mean compliance was 64.4% for DVT Risk Assessment and Reassessment and 61.3% for DVT Management, both Partially Compliant. This mirrors international evidence: the ENDORSE study across 32 countries found only 39.5% of at-risk medical patients received appropriate VTE prophylaxis.³ The present audit shows that nurses responsible for initiating assessment and prophylaxis are themselves functioning at a partially compliant level.

These findings align with the Indian Society of Critical Care Medicine (ISCCM)¹⁰, which identifies institution-wide education, standardised risk assessment tools, and regular audits as the primary means of closing compliance gaps.

The most consequential finding is the educational deficit: 78.0% of nurses had never received DVT training and 82.0% had not attended a workshop in the preceding two years. Trained nurses averaged 80.6% compliance versus 59.8% for untrained nurses — a difference of 20.8 percentage points (p<0.001). Daniel et al.¹¹ similarly reported that structured nursing educational interventions significantly improved DVT knowledge and practice compliance (p<0.001).

DVT Management was the weaker domain, with Mechanical Prophylaxis (60.1%) and Documentation and Communication (59.8%) both Non-Compliant. ASH guidelines¹² recommend mechanical VTE prophylaxis for critically ill patients not receiving pharmacological prophylaxis, making correct application technique a patient safety requirement. The non-significance of unit differences (Risk Assessment: p=0.818; Management: p=0.746) confirms deficits are institution-wide, indicating a hospital-wide mandatory DVT education programme is the primary intervention required.

FINDINGS

Only a minority of nurses were fully compliant with DVT Risk Assessment and Reassessment, and even fewer with DVT Management, indicating significant gaps in thromboprophylaxis practice in the critical care setting. Major weaknesses in scoring accuracy, reassessment procedures, mechanical prophylaxis, documentation, and communication were identified. Many nurses were unable to perform or accurately record a DVT risk assessment score, which may compromise patient safety and delay timely DVT prevention.

A significant proportion of nurses had not received formal education or training on DVT prevention. Structured educational exposure was strongly associated with higher levels of compliance.

Competency-based educational interventions are warranted, as nurses who had received prior DVT training demonstrated significantly better compliance with risk assessment, reassessment, and management practices than untrained nurses.

No significant associations were found between compliance and variables such as age, gender, educational qualification, or years of experience, suggesting that compliance is less dependent on general clinical experience and more related to specific DVT protocol training.

Compliance deficits were identified across all critical care units, suggesting the need for institution-wide quality improvement programmes rather than unit-specific initiatives.

IMPLICATIONS

- The results underscore the importance of reinforcing evidence-based DVT prevention practices among ICU nurses to enhance patient safety and reduce preventable thromboembolic complications in critically ill patients.
- Hospitals should place emphasis and importance on performing structured competency-based educational programs enhancing nurse's knowledge and applied skills in DVT risk assessment, prophylaxis, reassessment, and documentation process.
- The study highlights the need for improved accountability in documentation and communication, as incomplete or untimely documentation may adversely affect continuity of care and clinical decision-making within the healthcare team.
- Nursing administrators should regularly supervise nursing practice, conduct competency assessments, and carry out periodic clinical audits to evaluate adherence to thromboprophylaxis protocols and identify opportunities for improvement.
- The routine integration of standardised DVT risk assessment tools and electronic documentation systems in the ICU could improve compliance and minimise clinical errors.

RECOMMENDATIONS

These recommendations are aligned with the Indian Society of Critical Care Medicine (ISCCM) standards and national guidelines for DVT prevention and thromboprophylaxis compliance in critical care settings across India.

- To achieve a high level of competency in DVT prevention practices, DVT prevention training programmes should be routinely provided to all nurses employed in critical care units, and educational sessions should be delivered in workshop settings.
- Periodic simulation-based demonstrations and skills practice in mechanical prophylaxis application, documentation protocols, and DVT risk scoring systems should be organised to enhance clinical performance.
- To increase consistency and accuracy in practice, hospitals should implement standardised institutional DVT protocols and electronic risk assessment systems incorporating automated reminders and scoring tools.

- Closed-loop clinical audits should be conducted periodically within critical care settings to assess compliance trends, identify areas requiring improvement, and implement corrective measures.
- Nursing administrators should ensure the availability of adequate DVT prevention equipment, educational resources, and ongoing professional development support.
- Future multicentre studies with larger sample sizes are needed to further examine compliance with DVT prevention practices and to strengthen the evidence base for nursing practice in this area.

LIMITATIONS

- The study was conducted in a single tertiary care teaching hospital; therefore, the findings may not be generalisable to other healthcare facilities or clinical settings.
- The sample of 100 nurses from selected critical care units may not be representative of all ICU nurses across different healthcare settings.
- The observational audit methodology may have influenced nurses' usual practice during data collection, introducing potential observational (Hawthorne) bias.
- The study assessed compliance only and did not evaluate patient outcomes related to thromboprophylaxis effectiveness or DVT prevention practices.
- The cross-sectional design captured nursing practice at a single point in time and did not assess changes or improvements in compliance over time.

REFERENCES

- [1] Lutsey PL, Zakai NA. Epidemiology and prevention of venous thromboembolism. *Nat Rev Cardiol*. 2023;20(4):248-262. DOI: <https://doi.org/10.1038/s41569-022-00787-6>
- [2] Achaiabar KC, Waldmann CS. Prevention of venous thromboembolism in the critically ill patient. *J Intensive Care Soc*. 2015;16(3):199-201. DOI: <https://doi.org/10.1177/1751143715569404>
- [3] Cohen AT, Tapson VF, Bergmann JF, Goldhaber SZ, Kakkar AK, Deslandes B, et al. Venous thromboembolism risk and prophylaxis in the acute hospital care setting (ENDORSE study): a multinational cross-sectional study. *Lancet*. 2008;371(9610):387-394. DOI: [https://doi.org/10.1016/S0140-6736\(08\)60202-0](https://doi.org/10.1016/S0140-6736(08)60202-0)
- [4] Al-Mugheed K, Bayraktar N. Knowledge, risk assessment, practices, self-efficacy, attitudes, and behaviours towards venous thromboembolism among nurses: a systematic review. *Nurs Open*. 2023;10(9):6033-6044. DOI: <https://doi.org/10.1002/nop2.1914>
- [5] Alyousef HA, Badawi SEA, Elghoneimy YA, Alsharif AH, Alqahtani SM, Alharbi SH, et al. Nurses' knowledge and practices regarding the prevention of deep vein thrombosis. *Med Arch*. 2022;76(6):447-453. DOI: <https://doi.org/10.5455/medarh.2022.76.447-453>
- [6] Gibbs H, Fletcher J, Blombery P, Collins R, Wheatley D. Venous thromboembolism prophylaxis guideline implementation is improved by nurse-directed feedback and audit. *Thromb J*. 2011;9(1):7. DOI: <https://doi.org/10.1186/1477-9560-9-7>
- [7] Hu S, Huang J, Wang H, Wang Y. Nurses' knowledge, attitudes, and practices regarding deep vein thrombosis and the nursing management. *Sci Rep*. 2025;15:17174. DOI: <https://doi.org/10.1038/s41598-025-96551-0>
- [8] Guan X, Li L, Gong S, Wang Y, Zhen J. Investigation and analysis of status of mechanical prevention of venous thrombosis in ICU. *Nurs Open*. 2022;10(4):2648-2655. DOI: <https://doi.org/10.1002/nop2.1525>
- [9] Wu J, Zhu S, Munn Z, Zhou C. Improving compliance of risk assessment and nonpharmacological interventions for deep venous thrombosis prevention in a respiratory intensive care unit: a best practice implementation project. *JBIC Evidence Implementation*. 2021;19(3):268-278. DOI: <https://doi.org/10.1097/XEB.0000000000000260>
- [10] Jagiasi BG, Chhallani AA, Dixit SB, Kumar R, Pandit RA, Govil D, et al. Indian Society of Critical Care Medicine consensus statement for prevention of venous thromboembolism in the critical care unit. *Indian J Crit Care Med*. 2022;26(Suppl 2):S51-S65. DOI: <https://doi.org/10.5005/jp-journals-10071-24195>

- [11] Daniel M, Sarwar H, Iqbal S, Usnat F, Hameed S. Effects of nursing educational intervention on knowledge and practices of management of deep venous thrombosis. J Health Wellness Community Res. 2025;3(6):e320. Available from: <https://jhwcr.com/index.php/jhwcr/article/view/320>
- [12] Schünemann HJ, Cushman M, Burnett AE, Kahn SR, Beyer-Westendorf J, Spencer FA, et al. American Society of Hematology 2018 guidelines for management of venous thromboembolism: prophylaxis for hospitalized and nonhospitalized medical patients. Blood Adv. 2018;2(22):3198-3225. DOI: <https://doi.org/10.1182/bloodadvances.2018022954>

Copyright & License:

© Authors retain the copyright of this article. This work is published under the Creative Commons Attribution 4.0 International License (CC BY 4.0), permitting unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.