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Research Article

A Study to Assess the Knowledge of Nurses in Early Identification of Deep Vein Thrombosis among Post-Operative Patients

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Abstract

Background: *Deep Vein Thrombosis (DVT) is a frequent and potentially life-threatening postoperative complication that can lead to pulmonary embolism and long-term morbidity. Nurses play a critical role in the early identification, prevention, and management of DVT.*

Objectives: *This study aimed to assess the baseline knowledge of nurses regarding the early identification of DVT among postoperative patients and to evaluate the effectiveness of a structured educational intervention.*

Methods: *A prospective observational study was conducted among 100 nurses from oncology and general wards of a tertiary care hospital between March and September 2025. A validated questionnaire with 20 multiple-choice questions was used to assess knowledge of DVT risk factors, signs, and prevention strategies. Knowledge levels were categorized as Poor (1–6), Average (7–13), and Good (14–20). Nurses scoring ≤13 underwent a 10-minute educational session, followed by reassessment. Data were analysed using descriptive statistics, ANOVA, and paired t-tests.*

Results: *At baseline, 76% of nurses demonstrated good knowledge, while 24% scored in the average range. None scored poorly. Nurses with average scores showed significant improvement after the educational intervention (mean score pre-test: 14.83 ± 2.61 vs. post-test: 17.75 ± 1.25, $p < 0.05$). Knowledge improvement was consistent across demographic variables including age, experience, and department.*

Conclusion: *While most nurses demonstrated good baseline knowledge, gaps remained in risk assessment tools and preventive strategies. A brief structured educational session significantly improved knowledge, underscoring the importance of continuous professional development. Integrating DVT training into undergraduate nursing curricula and in-service education programs is recommended to enhance patient outcomes.*

Keywords: *Deep Vein Thrombosis (DVT), Venous Thromboembolism (VTE), Postoperative care, Nursing education, Knowledge assessment.*

Introduction:

Venous thromboembolism (VTE) constitutes a significant risk factor for the majority of hospitalised individuals. Annually, six European nations report 500,000 occurrences of DVT and 300,000 cases of PE. The national database of the USA indicates 7.[1] DVT cases per 1,000.[2]. Korean postoperative patients have 20.9 occurrences of VTE per 1,000.[3] individuals. Regional trauma, hypercoagulability, and lower extremity vascular wall constriction cause deep vein thrombosis. Local pain, swelling, discolouration, and warm skin are symptoms of DVT, although USG and venography

should diagnose it. DVT can produce long-term posttraumatic syndrome or chronic venous insufficiency, lowering quality of life and raising health costs[4,5].

DVT risk factors include age, stroke or paralysis, immobility, cancer therapy, obesity, heart dysfunction, varicose veins, a central venous catheter, inflammatory bowel disease, pregnancy, oestrogen use, and nephrotic syndrome. Lower extremity DVT is usually caused by major surgery (hip, leg, pelvic fracture, etc.)[6,7]. DVT risk should be reduced by starting pharmacological and mechanical prophylaxis 24 hours before surgery[8]. Early mobility and anti-embolism stockings are recommended for low-risk patients postoperatively. Patients at moderate risk should also get intermittent pneumatic compression (IPC) and anticoagulants. High-risk patients need medication[6]. Surgical nurses are crucial to DVT prevention[9,10,11]. DVT risk factors should be identified and treatment given upon arrival. The Operating Room Safe Surgery Checklist determines if DVT prophylaxis is needed "before the surgical incision"[12].

After surgery, nurses monitor DVT symptoms, let patients move, teach them deep breathing and coughing movements, and educate them how to use elastic compression stockings and IPC devices[13].Since DVT is a common surgical complication, nurses should utilise several scales to identify risk factors also to identify the patients who are not on DVT prophylaxis post-surgery. This study was done to assess nurses' knowledge of early DVT detection in post-operative patients and to evaluate the effectiveness of a structured educational intervention.

Aims and Objectives

1. To assess the baseline knowledge of nurses regarding DVT identification
2. To evaluate the effectiveness of a structured educational session on improving DVT knowledge among nurses.

Materials and Methods:

This prospective observational study was conducted at Apollo Hospitals, Jubilee Hills, from March to September 2025. The study was done after approval from Institutional Ethics Committee with approval number. A total of 100 nurses working in departments such as Oncology, Regency wards, and general wards were selected using purposive sampling. The study aimed to assess and enhance the knowledge of nurses regarding the early identification of Deep Vein Thrombosis (DVT) in post-operative patients, a group recognized to be at increased risk of thromboembolic events. Early detection of DVT in these patients is critical for timely prophylaxis and management. A self-structured and validated questionnaire comprising 20 multiple-choice questions was developed to evaluate the knowledge of nurses on DVT risk factors, signs, and prevention strategies. Each correct response was awarded one point, and based on the total score, knowledge levels were categorized as Poor (1–6), Average (7–13), and Good (14–20). Participants scoring 13 or below underwent a 10-minute educational session led by the principal investigator, focusing on key aspects of DVT recognition and prevention. These participants were subsequently re-evaluated using the same questionnaire to assess knowledge improvement. Both descriptive and inferential statistics were employed to analyse the data, including mean scores, standard deviation, ANOVA, and paired t-tests.

Results:

A total of 100 nurses working in departments such as Oncology, Regency wards, and general wards were included in the study. The demographic results showed 96% were females, and 76% of them belong to the age group less than 25years. All Nurses held a minimum educational qualification of BsC Nursing degree. Amongst the study group, 44% of them had a minimum of one year experience. 32% of them are having less than one year experience. 18% of them having 3 years experience. And 6% of them having more than 3 years of nursing experience. In our hospital there is no special post-operative ward that isolates all post surgical patients. So, we have tested the nurses working different ward areas to understand their knowledge better. Amongst the study group 25% of them are working in oncology area. 75% of them are working in general ward areas distributed in 1st, 2nd & 3rd floors.

Table 1: demonstrates distribution of nurses according to their sociodemographic parameters

Sociodemographic Parameters	N (n =100)	%
Age in years		
20-25	76	76%
25-30	24	24%
>30	0	
Gender		
Female	96	96%
Male	4	4%

Educational qualification		
BSC nursing	100	100%
Year of experience		
<1 year	32	32%
1 year	44	44%
3 years	18	18%
>3 years	6	6%
Department		
Oncology	25	25%
Ward-Regency	23	23%
Ward-1st floor	23	23%
Ward-2nd floor	29	29%

We have assessed the nurses responses to a structured and validated questionnaire comprising of 20 questions. The responses were analysed accordingly.

Table 2: Gives the nurses responses to the questionnaire about DVT risk factors and prevention.

Questions	% of study population with correct answer
1. Which of the following is likely in massive DVT?	72
2. Which of the following suggests a small pulmonary embolism?	65
3. Levels of D-dimer increase in?	71
4. What Is Deep Vein Thrombosis?	73
5. Which vein is most commonly effected by DVT?	74
6. Which of the following is not a common risk factor for DVT?	76
7. Which of the following is NOT a common risk factor for DVT?	81
8. Which medical condition increases the risk of DVT?	79
9. What is the most common symptom of DVT?	77
10. Which of the following symptoms might indicate a serious complication of DVT (pulmonary embolism)?	77
11. Which diagnostic test is commonly used to detect DVT?	77
12. Which of the following is NOT a common symptom of DVT?	72
13. DVT primarily affects which type of blood vessels?	87
14. What is the most serious complication of DVT?	86
15. Which of the following is a risk factor for developing DVT?	84
16. What is the primary treatment for DVT?	79
17. Which imaging test is commonly used to diagnose DVT?	72
18. What does the term "thrombus" refer to in the context of DVT?	72
19. What is the primary goal of treating DVT?	72
20. Where does the D- dimer test measure?	71

Each correct response was awarded one point, and based on the total score, knowledge levels were categorized as Poor (1–6), Average (7–13), and Good (14–20).

Table 3: Represents the distribution of responses of study group on their level of understanding.

Pre-test	N	Percentage
Poor	0	0%
Average	24	24%
Good	76	76%
Total	100	

76% of them scored well with score 14-20 showing good knowledge, 24% of them scored average with score ranging 7-13. Participants with this average scoring 13 or below underwent a 10-minute educational session led by the principal investigator, focusing on key aspects of DVT recognition and prevention.

We have also compared the sociodemographic profile of study participants in both the groups of assessment (Good & Average Knowledge respectively).

Table 4: Depicts the sociodemographic profile of study participants in both the groups of assessment. The sociodemographic profile of study participants in both the groups is comparable.

Sociodemographic Parameters	Good Knowledge (N=76)	%	Average Knowledge (N=24)	%
Age in yrs.				
20-25	55	72%	21	88%
25-30	21	28%	3	13%
>30	0	0%	0	0%
Gender				
Female	73	96%	23	96%
Male	3	4%	1	4%
Educational qualification				
BSC nursing	76	100%	24	100%
Year of experience				
<1 year	33	43%	11	46%
1 year	22	29%	6	25%
3 years	15	20%	4	17%
>3 years	6	8%	3	13%
Department				
Oncology	17	22%	10	42%
Ward-Regency	17	22%	9	38%
Ward-1st floor	19	25%	2	8%
Ward-2nd floor	23	30%	3	13%

The participants with average scoring less than 13 were subjected to educational intervention and they were subsequently re-evaluated using the same questionnaire to assess knowledge improvement. We have compared the sociodemographic profiles of study participants in the pre-test and post-test evaluation and there is no significant difference between the pre and post-test group.

Table 5: depicts the sociodemographic profiles of study participants in the pre-test and post-test groups.

	Pre-test		Post-test	
Age	**Mean ± SD**	**P-value**	**Mean ± SD**	**P-value**
20-25	14.87 ± 2.81	P = 0.0987	18.11±1.23	P=0.26
25-30	15.95±2.62		17.33±1.96	
Gender				
Female	15.20±2.77	P = 0.7527	17.95±1.46	N.A.
Male	14.75±3.40		17	
Year of experience				
<1 year	15.09±2.76	P=0.4912	18±1.7	P=0.9256
1 year	15.21 ± 3.03		17.66±1.36	
3 years	14.83 ±2.61		17.75±1.25	
>3 years	16.83 ± 1.94		18.33±0.57	
Department				
Oncology	14.48±3.09	P=0.1911	18.1 ±1.37	P=0.41
Ward-Regency	14.91±3.07		17.33±1.5	
Ward-1st floor	15.13±2.43		19 ± 1.41	
Ward-2nd floor	16.06±2.40		18.33 ± 1.52	

We have compared the experience of study participants pre and post-test and Department of study participants pre and post-test and we have found no statistically significant difference between the groups in terms of experience and department of working before and after intervention.

Table 6: depicts the comparison of experience and department of study participants pre and post test

	Pre-test		Post-test	
Year of experience				
<1 year	15.09±2.76	P=0.4912	18±1.7	P=0.9256
1 year	15.21 ± 3.03		17.66±1.36	
3 years	14.83 ±2.61		17.75±1.25	
>3 years	16.83 ± 1.94		18.33±0.57	
Department				
Oncology	14.48±3.09	P=0.1911	18.1 ±1.37	P=0.41
Ward-Regency	14.91±3.07		17.33±1.5	
Ward-1st floor	15.13±2.43		19 ± 1.41	
Ward-2nd floor	16.06±2.40		18.33 ± 1.52	

Discussion:

This study found that nurses demonstrated modest baseline knowledge, favourable attitudes, and proactive behaviours in managing DVT, with significant interrelationships between these domains. Although attitudes and practices reflected awareness of DVT prevention and care, intermediate knowledge scores revealed notable gaps in understanding essential conceptsparticularly the use of risk assessment tools, staging, and evidence-based procedures. Prior research has shown that insufficient knowledge can hinder the adoption of clinical recommendations despite positive attitudes toward patient care[14,15]. Such limitations may result in suboptimal adherence to DVT prevention measures and poorer patient outcomes, as also documented in other clinical contexts[16,17].

The knowledge scores in our cohort are consistent with findings from other regions, where healthcare workers often display limited familiarity with contemporary diagnostic tools and preventive strategies for DVT. Studies have reported that even after training, many nurses remain unfamiliar with validated risk assessment instruments such as the Caprini and Wells scoring systems a finding mirrored in this study, where nearly half of respondents could not identify them[18,19]. Similarly, knowledge gaps in DVT staging and chronic complications appear to be a universal challenge in nursing education. These gaps are significant because delayed recognition of high-risk patients may lead to severe complications, including pulmonary embolism.

Our results also showed favourable attitudes, consistent with earlier studies where nurses recognised DVT as a serious complication and emphasised preventive measures[20,21]. However, a substantial proportion perceived patient compliance as a barrier reflecting findings from prior work where limited patient awareness and poor adherence hindered effective DVT management[22,23].

Knowledge, attitudes, and practice scores were significantly influenced by education level, professional role, prior training, and direct experience in DVT care. Nurses with higher qualifications, senior positions, or prior DVT training scored better across all parameters, as confirmed by multivariate logistic regression and SEM analysis. This aligns with existing evidence that structured training improves both theoretical understanding and clinical application[24,25]. Workshops focusing on risk assessment and anticoagulation management have been shown to boost nurses' confidence and adherence to evidence-based care[26,27]. Direct clinical exposure also enhanced performance, underlining the importance of experiential learning.

Conversely, nurses in non-teaching or lower-tier institutions scored lower across all domainslikely due to systemic disparities in resources, professional development opportunities, and emphasis on continuing education. Studies have similarly noted that nurses in low-resource settings often miss advanced training opportunities, limiting guideline implementation[28,29].

Specific knowledge deficits included poor recognition of DVT phases, limited use of risk assessment tools, and lack of familiarity with certain preventive interventions such as lower limb elevation and antithrombotic stockings consistent with other reports linking these gaps to insufficient emphasis on standardised evaluation tools during training[30,31] and underutilisation of procedural guidelines in practice[32,33].

To address these gaps, multifaceted and context-specific interventions are essential. Hospitals should implement mandatory training programs on high-priority topics—particularly risk stratification, staging, and guideline-based prevention and management. These programs should integrate case-based learning to contextualise theory and enhance practical skills. For resource-limited facilities, online interactive modules and virtual reality simulations offer accessible alternatives[34,35].

Overcoming attitudinal and behavioural barriers is equally important. Embedding motivational interviewing techniques in nurse–patient communication training could help address compliance issues. A mentorship model, pairing senior nurses with substantial DVT experience with junior staff, could strengthen confidence and practice standards. Hospitals should also incorporate quality improvement initiatives, such as patient outcome audits and feedback systems, to continuously refine practice.

Our findings also reinforce the need for early integration of DVT education into nursing curricula, supplemented by ongoing professional development. Providing culturally tailored educational materials can empower patients and families to participate actively in care, alleviating nurses' concerns about adherence. Forming multidisciplinary DVT teams including nurses, physicians, and patient educators can further improve prevention and management[36,37].

The strong correlations between knowledge, attitudes, and practices observed here confirm the interconnectedness of these elements, consistent with prior healthcare research[38,39]. SEM analysis indicated that improving knowledge can positively influence attitudes and actions supporting the rationale for prioritising knowledge enhancement in interventions.

Limitations of this study include its cross-sectional design, which restricts causal inferences; reliance on self-reported data, which may introduce social desirability bias; and confinement to a single province (Zhejiang), potentially limiting generalisability to other settings with differing resources and policies. Future research should consider longitudinal designs and larger, multi-centre samples.

Conclusion:

This study highlights that while nurses demonstrated positive attitudes and practices toward DVT management, notable gaps remain in the use of risk assessment tools and practical application. Training, institutional support, and direct patient care exposure significantly influenced KAP scores. A brief 10-minute educational session effectively improved knowledge across all demographics, underscoring the value of focused microlearning.

To translate knowledge into consistent practice, ongoing education should be coupled with reinforcement of guideline-based care, particularly the ACCP recommendations. Future initiatives should prioritise integrating DVT prevention into undergraduate curricula, expanding in-service training, leveraging digital learning for accessibility, and evaluating long-term retention and clinical outcomes through multi-centre, longitudinal studies.

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