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Original Research

The Relationship between Knowledge of Phlebitis and Motivation for Phlebitis Prevention among Nursing Students in Tangerang

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A B S T R A C T

Phlebitis is a common nosocomial infection caused by invasive procedures such as intravenous catheter insertion, and it may lead to serious complications. Therefore, enhancing knowledge of phlebitis and motivation for its prevention is crucial among professional nursing students. This study aimed to identify the relationship between knowledge of phlebitis and motivation for phlebitis prevention among professional nursing students at a university in Tangerang. This study employed a quantitative correlational design with a cross-sectional approach. Participants were professional nursing students (n = 176) selected through purposive sampling. Data were collected using knowledge and motivation questionnaires. The results showed that most participants (56.8%) had poor knowledge of phlebitis; however, the majority of participants (80.7%) demonstrated high motivation for phlebitis prevention. Furthermore, the Spearman's rank correlation test revealed a moderate positive relationship between knowledge of phlebitis and motivation for phlebitis prevention ($r = 0.423$, $p < 0.001$), indicating that higher levels of knowledge of phlebitis were related to greater motivation to engage in phlebitis prevention. Although professional nursing students showed high motivation for phlebitis prevention, their level of knowledge remained inadequate. Strengthening educational strategies, including theoretical reinforcement, simulation-based learning, and structured clinical training, is necessary to improve students' knowledge and preparedness for safe nursing practice.

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INTRODUCTION

Phlebitis is an inflammation of the veins that occurs as a result of mechanical or chemical irritation, often caused by invasive procedures such as the insertion of an intravenous catheter. Common symptoms include redness, tenderness, and swelling around the infusion site (Cahyadi et al., 2020). If left untreated, phlebitis can progress to thrombophlebitis

and lead to serious complications such as embolism and permanent damage to the vein (Rahmawati et al., 2020). This condition is classified as a nosocomial or hospital-acquired infection (HAI), which frequently occurs in healthcare settings (Mariana & Asrul, 2020).
According to the Global Report on Infection Prevention and Control 2024, on average, out of every 100 patients admitted to acute care hospitals, seven patients in high-income countries (HICs) and 15 patients in low- and middle-income countries (LMICs) experience at least one HAI during hospitalization (WHO, 2024). In Indonesia, the Ministry of Health has established that the acceptable incidence rate of phlebitis should not exceed 1% (Tahir et al., 2023). Nevertheless, data regarding the incidence of phlebitis in Indonesia over the past five years remain limited. The most recent available data are based on the 2013 Ministry of Health survey, which reported phlebitis incidence rates of 50.11% in public hospitals and 32.70% in private hospitals (Tahir et al., 2023).

The high incidence of phlebitis indicates that phlebitis prevention efforts have not been optimal. Phlebitis prevention requires not only technical skills but also adequate knowledge of aseptic principles, appropriate selection of intravenous insertion sites, and early detection of phlebitis symptoms (Hafidhuddin et al., 2022). As future healthcare professionals who are involved in intravenous catheter insertion during clinical practice, nursing students need to understand and properly implement phlebitis prevention measures. Hafidhuddin et al. (2022) found that the majority of final-year nursing students at Universitas Binawan had a moderate level of knowledge regarding phlebitis.

However, good knowledge alone is not sufficient to ensure optimal preventive behavior. This indicates that although students' knowledge level is categorized as moderate, it does not necessarily translate into optimal phlebitis prevention practices in clinical settings. Intrinsic and extrinsic motivation play an important role in ensuring compliance with clinical procedures, including phlebitis prevention. According to motivation theory, individual actions are influenced by internal needs as well as environmental factors that drive a person to act (Demang et al., 2022). In line with this, compliance with standard operating procedures (SOPs) for intravenous catheter insertion is also one of the factors that may influence the occurrence of phlebitis in patients (Safitri et al., 2023).

A study conducted by Hafidhuddin et al. (2022b) showed that nursing students' level of knowledge regarding phlebitis was still suboptimal, with 45.5% of participants having a moderate level of knowledge, 43.2% having a low level of knowledge, and only 11.4% demonstrating a good level of knowledge. These findings indicate a knowledge gap that may affect students' ability to implement phlebitis prevention measures during clinical practice. Furthermore, Ulfa et al. (2025) found that motivation was significantly associated with nurses' compliance with standard precautions (p-value = 0.010), suggesting that higher motivation can improve adherence to infection prevention procedures. In the context of nursing students, strong motivation may similarly encourage the implementation of phlebitis prevention measures in accordance with clinical practice standards.

However, studies specifically examining the relationship between knowledge of phlebitis and motivation for phlebitis prevention among nursing students remain limited. This gap highlights the need for further research to analyze how knowledge influences students' motivation to prevent phlebitis. Therefore, based on this phenomenon, the present study aimed to investigate the relationship between knowledge of phlebitis and motivation for phlebitis prevention among nursing students at a university in Tangerang.

METHOD

This study employed a quantitative correlational design with a cross-sectional approach to examine the relationship between knowledge of phlebitis and motivation for phlebitis prevention. The population consisted of 263 professional nursing students at a private university in Tangerang, Indonesia. Participants were recruited using a purposive sampling technique, with a minimum sample size of 176, determined using the Slovin formula with a 5% margin of error and a 10% anticipated dropout rate.

Participants were eligible for inclusion if they were actively enrolled in the Entry-to-Practice or Conversion Class nursing professional programs. The exclusion criteria included students who were on leave of absence, inactive in the program, undergoing academic suspension or disciplinary sanctions, and those who had participated in the preliminary validity and reliability testing of the research instruments.

The instruments used in this study were digital questionnaires consisting of demographic data (age and gender), a phlebitis knowledge questionnaire developed by Yuhelma et al. (2019) comprising 8 multiple-choice questions, and a motivation for phlebitis prevention questionnaire developed by Rinawan (2024) consisting of 10 Likert-scale statements. Prior to data collection, the research instruments were tested for validity and reliability on February 28, 2025, among professional nursing students. The results showed that all items in both questionnaires were valid, with corrected item-total correlation values exceeding 0.361. Furthermore, both instruments

demonstrated acceptable reliability, with Cronbach's alpha coefficients of 0.616 for the phlebitis knowledge questionnaire and 0.767 for the motivation for phlebitis prevention questionnaire. According to the criteria proposed by Hastono (2021), a Cronbach's Alpha value greater than 0.60 indicates good reliability; therefore, both questionnaires were considered reliable.

Data were collected after obtaining approval from the Ethics Committee of the Faculty of Nursing, Universitas Pelita Harapan (No. 022/KEPFON-AMENDMENT/V/2025) and permission from the faculty. Before data collection, the researcher conducted validity and reliability testing of the research instruments. After the instruments were confirmed to be valid and reliable, the questionnaires were distributed digitally via Google Forms, accompanied by an informed consent form. Descriptive statistics were used to describe participants' characteristics, levels of knowledge of phlebitis, and motivation for phlebitis prevention, while Spearman's rank-order correlation test was used to examine the relationship between knowledge of phlebitis and motivation for phlebitis prevention.

RESULT

A total of 176 professional nursing students participated in this study. The majority of participants were in the late adolescence age group (18–21 years), representing 56.3% of the sample, while female students accounted for 93.8% of the study population (Table 1).

Table 1. Sociodemographic Characteristics (n=176)

Characteristics	Frequency (n)	Percentage %
Age		
Late adolescence (18-21 years)	99	56.3
Early adulthood (22-25 years)	77	43.8
Gender		
Male	11	6.3
Female	165	93.8

As shown in Table 2, poor knowledge of phlebitis was the most prevalent category among participants, representing 56.8% of the study population. In contrast, only a small proportion of participants demonstrated good knowledge of phlebitis (2.3%).

Table 2. Phlebitis Knowledge of Professional Nursing Students (n=176)

Category	Frequency (n)	Percentage (%)
Good	4	2.3
Moderate	72	40.9
Poor	100	56.8

The majority of participants demonstrated a high level of motivation for phlebitis prevention, accounting for 80.7% of the study population (Table 3).

Table 3. Motivation for Phlebitis Prevention of Professional Nursing Students (n=176)

Category	Frequency (n)	Percentage (%)
High	142	80.7
Low	34	19.3

As presented in Table 4, Spearman's rank-order correlation test indicated a moderate positive relationship between knowledge

of phlebitis and motivation for phlebitis prevention among professional nursing students ($r = 0.423$, $p < 0.001$). The findings suggest that higher levels of knowledge of phlebitis were associated with greater motivation to engage in phlebitis prevention.

Table 4. Relationship between Phlebitis Knowledge and Motivation for Phlebitis Prevention of Professional Nursing Students (n=176)

Knowledge	Motivation				Total		Correlation Coefficient*	Sig.(2-Tailed)*
	High		Low					
	n	%	n	%	n	%		
Good	4	2.3	0	0	4	2.3	0.423	<.001
Moderate	72	40.9	0	0	72	40.9		
Poor	66	66	34	34	100	56.8		

DISCUSSION

Study findings indicated that the majority of nursing students had a poor level of knowledge regarding phlebitis. Although studies specifically assessing knowledge of phlebitis remain limited, a considerable number of studies have investigated knowledge related to peripheral intravenous catheter (PIVC) management. Since phlebitis is one of the most common complications associated with PIVC use (Kaphan et al., 2024), these findings may reflect a similar gap in knowledge of PIVC management and its related complications.

The findings of this study are consistent with previous studies conducted among nursing students in Ethiopia, Italy, and Nepal, which reported deficient knowledge regarding peripheral intravenous catheter (PIVC) management (Etafa et al., 2020; Sharma et al., 2022; Simonetti et al., 2019). However, these findings contrast with those of Hernon et al., (2024), who reported that although nursing students demonstrated limited knowledge of venipuncture and PIVC insertion skills, phlebitis was the complication most commonly understood by the students. In contrast, studies conducted among professional nurses in Ethiopia, Malaysia, Pakistan, and China have generally reported adequate knowledge of PIVC management (Dessalegn et al., 2024; Nordin et al., 2023; Qamar et al., 2017; Xu et al., 2020). This difference highlights a gap in knowledge between nursing students and practicing nurses, suggesting that competence in PIVC management may improve as individuals transition from academic training to professional clinical practice. Given that peripheral intravenous catheters are widely used in clinical settings and that phlebitis remains one of the most common catheter-related complications (Kaphan et al., 2024), adequate knowledge among nursing students and nurses is essential for preventing complications, reducing patient morbidity, shortening hospital stays, and minimizing healthcare costs (Simonetti et al., 2019).

The poor level of knowledge observed in this study may reflect insufficient reinforcement of phlebitis-related theoretical content during nursing education. Phlebitis is often addressed as a component of intravenous therapy and patient safety rather than as a distinct topic of study. Furthermore, nursing students may have limited opportunities to encounter and manage phlebitis cases directly during clinical placements, particularly when exposure to intravenous therapy complications is infrequent. This situation may be further compounded when laboratory training or simulation sessions related to intravenous catheter insertion and maintenance are not conducted regularly, leading to limited understanding of complications such as phlebitis. Previous evidence has shown that greater participation in training activities is associated with higher levels of knowledge acquisition (Ahlin et al., 2017).

The findings may also be supported by the characteristics of the Indonesian nursing professional curriculum. During the professional stage, learning activities are predominantly conducted in clinical settings, where students are expected to integrate and apply the theoretical knowledge acquired during the academic phase to direct patient care. Although clinical exposure is essential for developing practical competencies, the emphasis on practice-based learning may reduce opportunities for the structured reinforcement of specific theoretical concepts, including phlebitis prevention and management. Consequently, gaps in students' understanding of phlebitis may persist despite ongoing clinical training. This finding is consistent with the concept of the knowledge–practice gap in nursing education, whereby theoretical knowledge is not always effectively integrated into clinical practice (Gassas, 2021). Therefore, greater emphasis should be placed on phlebitis-related content within the curriculum. Simulation-based learning, regular skills training, and structured clinical experiences supported by preceptors may help strengthen students' knowledge and facilitate the integration of theory into practice (Etafa et al., 2020).

Despite the poor level of knowledge observed among participants, motivation toward phlebitis prevention was generally high. This finding suggests that motivation may be influenced by factors beyond knowledge acquisition alone. Nursing students, particularly those in the professional stage, are trained to implement patient safety principles and infection prevention practices throughout both their academic and clinical education (Amavasi & Zimmerman, 2024). As phlebitis is widely recognized as a preventable complication of intravenous therapy, students may perceive its prevention as an important aspect of patient safety and quality of care (Guanche-Sicilia et al., 2021; Nickel, 2019; Oliveira et al., 2019). Continuous exposure to patient safety standards and professional responsibilities during clinical training may foster a strong commitment to preventing avoidable complications. In addition, a high level of intrinsic motivation to become active learners may be reflected in nursing students' adherence to clinical standards, guidelines, and evidence-based practices (Gassas, 2021). Consequently, students may demonstrate high motivation toward phlebitis prevention even when their specific knowledge regarding phlebitis remains limited.

This study identified a moderate positive relationship between knowledge of phlebitis and motivation for phlebitis prevention among professional nursing students, suggesting that students with greater knowledge of phlebitis tend to demonstrate higher motivation to engage in phlebitis prevention. In other words, greater knowledge of phlebitis can enhance motivation to prevent it. However, a discrepancy was observed: most participants demonstrated poor knowledge of phlebitis but exhibited high motivation to engage in preventive measures. This condition may be attributed to concerns about negative consequences, such as the risk of infection or reprimands from supervisors, which drive students' motivation to prevent phlebitis despite an incomplete understanding of the condition (Alhazimi et al., 2022).

Motivation is a key determinant of educational achievement, positively associated with learning outcomes, and plays a crucial role in facilitating academic success (Rafii et al., 2019). Motivation is essential for nursing students, as it encourages continuous learning and the development of knowledge and competencies required to deliver high-quality nursing care (Rose, 2011). Students with strong intrinsic motivation are more likely to be driven to learn, achieve academic success, and actively engage in educational activities (Nilsson & Warrén Stomberg, 2008). These students often view education as an opportunity to satisfy their curiosity and are genuinely interested in acquiring new knowledge (Rafii et al., 2019).

This finding suggests that students with a better understanding of phlebitis risk factors, clinical manifestations, complications, and evidence-based prevention strategies are more likely to recognize the importance of preventive interventions and demonstrate greater motivation to implement them. This is supported by previous research findings, which also show that students better understand learning materials and demonstrate higher motivation, improved study strategies, and better performance when they are aware of the reasons for learning the material (Padilha et al., 2019; Singh et al., 2021). On the other hand, existing evidence has demonstrated that knowledge of intravenous therapy management is associated with improved adherence to best practices for preventing catheter-related complications, including phlebitis (Teixeira et al., 2025). Therefore, improving students' knowledge may represent an important strategy for strengthening their motivation and commitment to evidence-based phlebitis prevention, thereby enhancing the quality and safety of patient care.

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design only allows the identification of associations between phlebitis knowledge and prevention motivation at a single point in time and does not permit causal inferences. Second, the study was conducted within a single educational institution, which may

limit the generalizability of the findings to nursing students in other academic or clinical settings with different characteristics, such as curriculum, educational facilities, or clinical experiences. Finally, this study focused exclusively on knowledge and motivation and did not examine other variables that may influence preventive behaviors. Future studies should employ multicenter designs and larger and more diverse samples to better understand the complex factors influencing motivation toward phlebitis prevention among nursing students.

CONCLUSION

This study found that professional nursing students had a poor level of knowledge regarding phlebitis despite demonstrating a high level of motivation for its prevention. This discrepancy suggests a gap between cognitive understanding and motivational aspects of learning outcomes. Although motivation was high, insufficient reinforcement of phlebitis-related theoretical content and limited structured training may have contributed to inadequate knowledge. Therefore, strengthening phlebitis education through enhanced theoretical integration, simulation-based learning, and structured clinical experiences supported by preceptorship is essential to improve students' preparedness for safe and evidence-based nursing practice.

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REFERENCES

Ahlin, C., Klang-Söderkvist, B., Johansson, E., Björkholm, M., & Löfmark, A. (2017). Assessing nursing students' knowledge and skills in performing venepuncture and inserting peripheral venous catheters. Nurse Education in Practice, 23, 8–14. https://doi.org/10.1016/j.nepr.2017.01.003

Alhazimi, F. H., Almajdi, N. L. A., Alrasheedi, E. O. A., Alrashdi, M. O. A., & Albazaly, M. A. (2022). Evaluating the impact of an educational program based on the Health Belief Model in promoting preventive behaviors for nosocomial infections among nurses. Journal of Population Therapeutics and Clinical Pharmacology, 29(3), 584–589. Retrieved from https://www.jptcp.com/index.php/jptcp/article/view/5435

Amavasi, B., & Zimmerman, P.-A. (2024). Infection prevention and control continuous education and training in pre-registration nursing programmes. Nurse Education Today, 133, 106051. https://doi.org/10.1016/j.nedt.2023.106051

Cahyadi, L. O. R., Harun, A. A., & Indriastuti, D. (2020). Gambaran pengetahuan perawat mengenai resiko kejadian phlebitis di Kabupaten Konawe Selatan. Jurnal Keperawatan, 04(01), 1–5. Retrieved from https://jurnal.karyakesehatan.ac.id/JK/article/view/238

Demang, F. Y., Herman, A., Juanamasta, I. G., Pramana, C., Hidayat, R., Amir, H., Nurman, M., Rezkiki, F. N., Jakri, Y., Safitri, Y., Mariati, L. H., Badi'ah, A., Kartika, I. R., Ningsih, N. F., Jennifa, & Febrina, W. (2022). Manajemen keperawatan (E. A. Munandar, Ed.). Media Sains Indonesia. Retrieved from https://medsan.co.id/home/editor/23-arif-munandar?search=manajemen

Dessalegn, A., Ali, M. S., Yohannes, S., Tamir, Y., Mulatu, S., & Zewdie, A. (2024). Knowledge, practice and associated factors towards intravenous cannula-related infection prevention among nurses working at Northwest Amhara Regional State Comprehensive Specialized Hospitals, Ethiopia. BMC Nursing, 23(1), 168. https://doi.org/10.1186/s12912-024-01737-y

Etafa, W., Wakuma, B., Tsegaye, R., & Takele, T. (2020). Nursing students' knowledge on the management of peripheral venous catheters at Wollega University. PLoS ONE, 15(9 September). https://doi.org/10.1371/journal.pone.0238881

Gassas, R. (2021). Sources of the knowledge-practice gap in nursing: Lessons from an integrative review. Nurse Education Today, 106, 105095. https://doi.org/https://doi.org/10.1016/j.nedt.2021.105095

Guanche-Sicilia, A., Begoña Sánchez-Gómez, M., Elisa Castro-Peraza, M., Ángel Rodríguez-Gómez, J., Gómez-Salgado, J., & Duarte-Clíments, G. (2021). healthcare Prevention and Treatment of Phlebitis Secondary to the Insertion of a Peripheral Venous Catheter: A Scoping Review from a Nursing Perspective. https://doi.org/10.3390/healthcare

Hafidhuddin, A. Y., Dewi, A., & Astuti, P. (2022). Tingkat pengetahuan mahasiswa keperawatan tentang phlebitis. Binawan Student Journal (BSJ), 4(3), 1–7. Retrieved from https://journal.binawan.ac.id/bsj/article/view/479

Hastono, P. S. (2021). Analisis data pada bidang kesehatan. Rajawali Pers

Hernon, O., McSharry, E., Simpkin, A. J., Maclaren, I., & Carr, P. J. (2024). Evaluating Nursing Students' Venipuncture and Peripheral Intravenous Cannulation Knowledge, Attitude, and Performance: A Two-Phase Evaluation Study. Journal of Infusion Nursing, 47(2), 108–119. https://doi.org/10.1097/NAN.0000000000000539

Kaphan, K., Auypornsakul, S., Somno, J., Wongwattananan, W., Jamsittikul, K., Baicha, W., Somsri, S., & Sawatrak, T. (2024). The Prevalence and Associated Factors of Peripheral Intravenous Complications in a Thai Hospital. Journal of Infusion Nursing, 47(2), 120–131. https://doi.org/10.1097/NAN.0000000000000538

Mariana, D., & Asrul, M. (2020). Hubungan jumlah insersi dengan kejadian phlebitis pada pasien anak di rumah sakit umum daerah kota Kendari. Jurnal Keperawatan (JKp), 8(2), 87–94. Retrieved from https://ejournal.unsrat.ac.id/index.php/jkp/article/view/32325

Nickel, B. (2019). Peripheral Intravenous Access: Applying Infusion Therapy Standards of Practice to Improve Patient Safety. Critical Care Nurse, 39(1), 61–71. https://doi.org/10.4037/ccn2019790

Nilsson, K. E. L., & Warrén Stomberg, M. I. (2008). Nursing students motivation toward their studies – a survey study. BMC Nursing, 7(1), 6. https://doi.org/10.1186/1472-6955-7-6

Nordin, N., Bakar, K., Sharoni, S., Fauzi, R., & Seman, N. (2023). Assessment of peripheral intravenous catheter (PIVC) knowledge and perceptions of phlebitis risk factors among nurses in a University Hospital in Selangor. The Malaysian Journal of Nursing, 15(1), 80–92. https://doi.org/10.31674/mjn.2023.v15isupp1.009

Oliveira, A. D. S. S., Basto, M. L., Braga, L. M., Sena, C. A., Melo, M. N., & Parreira, P. M. D. S. D. (2019). Nursing practices in peripheral venous catheter: Phlebitis and patient safety. Texto e Contexto Enfermagem, 28. Retrieved from https://www.scielo.br/j/tce/a/v5FntF5GhssrQLRRBRYv3PP/?format=html&lang=en

Padilha, J. M., Machado, P. P., Ribeiro, A., Ramos, J., & Costa, P. (2019). Clinical Virtual Simulation in Nursing Education: Randomized Controlled Trial. J Med Internet Res, 21(3), e11529. https://doi.org/10.2196/11529

Qamar, Z., Afzal, M., Kousar, R., Waqas, A., Amir Gilani, S., & Student, P. R. (2017). Assess Nurses Knowledge and Practices towards Care and Maintenance of Peripheral Intravenous Cannulation in Services Hospital Lahore, Pakistan. Saudi Journal of Medical and Pharmaceutical Sciences, 3(6B), 608–614. Retrieved from https://saudijournals.com/media/articles/SJMPS_36B608-614.pdf

Rafii, F., Saeedi, M., & Parvizy, S. (2019). Academic motivation in nursing students: A hybrid concept analysis. Iranian Journal of Nursing and Midwifery Research, 24(5), 315–322. https://doi.org/10.4103/ijnmr.IJNMR_177_18

Rahmawati, W. A., Marliany, H., & Sukmawati, I. (2020). Description of the implementation of phlebitis prevention in the inpatient installation of the Ciamis district general hospital in 2019. Jurnal Stikes Muhammadiyah Ciamis : Jurnal Kesehatan, 7(1), 77–86. Retrieved from https://ojs.stikesmucis.ac.id/index.php/jurkes/article/view/92

Rinawan, S. (2024). Hubungan motivasi perawat dengan pencegahan phlebitis di RSIA Budhi Mulia Pekanbaru (Skripsi, Institut Kesehatan dan Teknologi Al Insyirah, Pekanbaru). Institut Kesehatan dan Teknologi Al Insyirah.

Rose, Stacy. (2011). Academic success of nursing students: Does motivation matter? Teaching and Learning in Nursing, 6(4), 181–184. https://doi.org/10.1016/j.teln.2011.05.004

Safitri, J. E., Qodir, A., & Kurniyanti, M. A. (2023). Hubungan tingkat kepatuhan perawat dlaam pelaksanaan SPO pemasangan infus terhadap kejadian phlebitis di RS. Media Husada Journal of Nursing Science, 4(1), 25–35. https://doi.org/10.33475/mhjns.v4i1.118

Sharma, M., Paudel, S., Shrestha, U., & Sitaula, B. (2022). Knowledge of Intravenous Cannulation among Interns of a Teaching Hospital: A Descriptive Cross-sectional Study. Journal of the Nepal Medical Association, 60(247), 290–293. Retrieved from https://pmc.ncbi.nlm.nih.gov/articles/PMC9226746/

Simonetti, V., Comparcini, D., Miniscalco, D., Tirabassi, R., Di Giovanni, P., & Cicolini, G. (2019). Assessing nursing students' knowledge of evidence-based guidelines on the management of peripheral venous catheters: A multicentre cross-sectional study. Nurse Education Today, 73, 77–82. https://doi.org/10.1016/j.nedt.2018.11.023

Singh, H. K., Joshi, A., Malepati, R. N., Najeeb, S., Balakrishna, P., Pannerselvam, N. K., Singh, Y. K., & Ganne, P. (2021). A survey of E-learning methods in nursing and medical education during COVID-19 pandemic in India. Nurse Education Today, 99, 104796. https://doi.org/https://doi.org/10.1016/j.nedt.2021.104796

Tahir, N. S., Kadir, S., & Boekoesoe, L. (2023). Faktor risiko kejadian healthcare associated infections phlebitis pada pasien rawat inap di RSUD Dr.M.M Dunda Limboto. Health Information : Jurnal Penelitian, 15(2), 1–8. Retrieved from https://myjurnal.poltekkes-kdi.ac.id/index.php/hijp/article/view/1050

Teixeira, J., Bastos, C., & Pinto, M. do R. (2025). Adherence to peripheral venous catheters' guidelines by emergency nurses: A systematic review. International Journal of Nursing Studies Advances, 9, 100441. https://doi.org/https://doi.org/10.1016/j.ijnsa.2025.100441

Ulfa, M., Adi, M. S., & Suryoputro, A. (2025). Nurses' motivation, knowledge and perception on compliance with standard precautions. Malahayati International Journal of Nursing and Health Science, 8(3), 374–380. https://doi.org/10.33024/minh.v8i3.833

WHO. (2024). Global report on infection prevention and control 2024. https://iris.who.int/home

Xu, B., Zhang, J., Hou, J., Ma, M., Gong, Z., & Tang, S. (2020). Nurses' knowledge of peripherally inserted central catheter maintenance and its influencing factors in Hunan province, China: A cross-sectional survey. BMJ Open, 10(5). https://doi.org/10.1136/bmjopen-2019-033804

Yuhelma, Y., Arif, Y., & Merdawati, L. (2019). Hubungan

pengetahuan plebitis dengan keterampilan tenaga kesehatan dalam menerapkan Problem Solving for Better Health pada plebitis di Rumah Sakit X. Jurnal Kesehatan Andalas, 8(4), 232–239. https://doi.org/10.25077/jka.v8i4.114