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Nursing Intervention for Incidence Phlebitis Prevention in Adult Patient: A Systematic Review

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ABSTRACT

Phlebitis refers to the inflammation or irritation of the vein wall, often caused by mechanical, chemical, or bacterial factors. Mechanical phlebitis is related to the action of the peripheral intravenous catheter (PIVC), chemical phlebitis arises from infusates or medications, and bacterial phlebitis is due to contamination at the insertion site or in the intravenous solution or tubing. Catheter-associated bloodstream infections (CABSI) can significantly increase healthcare costs, with treatment costs ranging from $3,000 to $56,000 per episode and prolonged hospital stays averaging 7 to 14 days (Marsh et al., 2024). This study, titled Nursing Intervention for Incidence Phlebitis Prevention in Adult Patient: A Systematic Review, aims to identify effective interventions that can be adopted by healthcare facilities, particularly in wards, to prevent phlebitis. This article analyzes data from six databases: Scopus, PubMed, ProQuest, ScienceDirect, Google Scholar, and Web of Science, focusing on articles published between 2019 and 2025. A total of 10 articles with randomized controlled trial (RCT) designs, scoring above 70% on the JBI assessment, were selected. The results indicate that moist heat therapy significantly improved vein visibility and palpability, reduced pain during cannulation, and increased first-attempt success to 93.3%. Clinically indicated catheter removal was found to be as effective as routine 96-hour replacement for preventing phlebitis.

KEYWORDS *Nurse Intervention, Prevention , Incidence Phlebitis.*

INTRODUCTION

Peripheral intravenous catheterizations (PIVC) are invasive clinical procedures applied to both adult and pediatric patients to administer intravascular fluids, drugs, and contrast agents based on Sumi Cho in (Cho & Kim, 2025). Phlebitis is the irritation or inflammation of a vein wall and is categorized as mechanical (related to the action of the PIVC in the vein), chemical (related to infusate or medication), or bacterial (related to contamination at the insertion site, intravenous solution, or tubing). Infiltration is the leakage of fluid out of the vein, and extravasation is the leakage of a vesicant drug out of the vein. Phlebitis, caused by irritation of blood vessels due to friction from the catheter tip, is a common complication from peripheral IV fluid administration (Kaphan et al., 2024a).

Phlebitis is a part of patient safety should be carried out and continuous to care by nurses in hospital (Susriyanti et al., 2023). Phlebitis is defined as inflammation of the intimal layer of the vein, resulting from a response to tissue damage associated with the use of a PVC and accompanied by different signs and symptoms, such as erythema, pain, edema, the appearance of a palpable cord along the vein and/or purulent drainage according to Infusion Nurses Society (2021) in (Oliveira et al., 2024). The use of PIVCs is associated with the risk of complications such as phlebitis, infiltration, and extravasation (Kaphan et al., 2024b)4(5). Peripheral venous catheterization (PVC) is a medical practice commonly carried out by nurses within healthcare

facilities to administer medications, fluids, blood, and blood products, aiding in the diagnosis and treatment of patients (Tosun et al., 2024).

This securement must be carried out and maintained at all times in a clean and aseptic manner. In some patients, asepsis can be difficult to maintain due to skin moisture or the lack of cooperation by the patient during the securement procedure, generating an increased risk of PIVC extraction (up to 70% of devices), extravasation (3%), phlebitis (10%), or bloodstream infections (3%) (Ferraz-Torres et al., 2024). According to WHO, cited by Istiqomah and Nurhayati (2023), there were 89 million HAIs cases globally, with 10% of the incidents occurring in Southeast Asia. According to data from the Ministry of Health cited by Rahmawati and Dhamanthi (2021), HAIs infections in Indonesia reached 15.74%.

According to the Ministry of Health cited by Sundoro et al. (2020), data from 11 hospitals in DKI Jakarta showed that Central Line-Associated Bloodstream Infections (CLABSI) were 26.4%. Reducing the risk of plebhitis by carrying out prevention bundles cannot be separated from the part of conducting assessments before installation. The assessment before installation is to assess the condition of the vein, the location of the insertion, determine the size of the catheter cannula and consider what therapy will be given based on Yasuda et al., (2022) in Sulistyorini (2022) (Sulistyorini et al., 2022).

The increase of number of phlebitis will be more impact to the risk of an increased Length Of Stay (LOS) of patient and the quality of service will be worst. Some emergency department (ED) patients need peripheral vascular catheterization for blood sample extraction, for both diagnostic purposes and the administration of intravenous (IV) therapy. Nurse training is therefore key, as time is lost if there has to be a switch in the health provider performing the procedure (Salleras-Duran et al., 2024). Insertion of an IV catheter inappropriate will increase the occurance of phlebitis. The presence of a venous catheter is accepted as a major risk factor for development of bloodstream infections(Lopes et al., 2024).

Early detection of the incidence of Phlebitis will be more effective to determine the next intervention can be practice to reduction the complication of phlebitis. Nurses has the important role in prevent the incidence of Phlebitis. Nurses are important workers in the care and monitoring of complications from peripheral IV fluid administration. Nurses should be aware and develop guidelines for preventing complications from peripheral IV fluid administration (Kaphan et al., 2024a). Prevent the incidence of phlebitis will be prioritized with enhanced the method to minimizing complications of phlebitis to patient.

Patient Safety is the existence of dangers that can be prevented for patients during the health care process by implementing a culture of work discipline. The provision of nursing care can have a positive impact, namely it can increase the patient's recovery, because the patient feels fulfilled physical, emotional and spiritual needs and the patient feels comfortable with the nurse's services (Brenda S, 2000) in Anitarini, (2020) (Anitarini et al., 2020)(2). Healthcare-associated infections (HAIs) occur in hospital settings or after discharge, and can cause serious complications for patients, such as prolonged hospitalization, increased treatment costs and, in more serious cases, even risk of death (Pereira et al., 2024).

Intervention of prevented phlebitis are include applying warm compresses and rotating the infusion insertion site every 72-98 hours. Some artickel suggested the way to prevent phlebitis also, and it should be compare with the knowledge and skill of a nurse. The nurse's responsibility is to prevent phlebitis and its evaluation, follow-up, and care when it develops.

The nurse's primary goal is to know and apply appropriate techniques to prevent phlebitis resulting from PIC application. If phlebitis develops despite the nurse's attention to all practices, appropriate nursing interventions should be planned (Aksoy & Bayram, 2023) (1).

PDCA (Plan-Do-Check-Act) nursing can drive continuous quality improvement through iteractive evaluation and adjustment, evidence-based decision-making to effectively identify and resolve issues, patient-centric focus on needs and feedback, enhanced nursing experience and satisfaction, improved team communication and collaboration, and overall elevation of nursing standards (Chen, 2025). Based on Marsh, 2024 stated present-day peripheral intravenous catheter associated bloodstream infection rates are less clearly defined (Mermel, 2017). However, the impact is clear.

Catheter-associated bloodstream infections can increase healthcare costs by US$3000 to $56,000 per episode for treatment and prolong hospital admission on average 7 to 14 days (Marsh et al., 2024). Based on study by Cabrero stated that the short durability (38–96 hours) and the high rate of failure of around 30% to 40% requires patients to undergo multiple venipunctures until the end of treatment. In addition, some studies describe that venous access may be difficult and require more than 3 venipuncture attempts in 36% of hospitalized patients (Cabrero et al., 2024). The impact of phlebitis could harm the patient safety, and need the strategy to 736nstrum this problem. The aim of this study was to determine the proper interventions that can be adopted by health facilities particularly in wards to prevent the incidence of phlebitis.

METHOD

This study was conducted in accordance with Preferred Reporting Items For Systematic Reviews And Meta-Analyses (PRISMA) with the study design Randomized Controlled Trial (RCT). Data based were used in this article were searched by five databases: Scopus, PubMed, Cochrane, Proquest, and CINAHL. Databases were searched with range of 6 years (2019-2025) published artickel and used Medical Subject Headings and Boolean Operator. The amount of Artickels are 1410, consist of: Proquest (n=392 artickel), Scopus (n=98 artickel), PubMed (n=312 artickel), Web Of Science (n=73 artickel), Google Scholar (n=82 artickels) dan Science Direct artickel (n=453).

Table 1. Boolean Operator

NO	Data Base	Boolean Operator	Result
1	Proquest	"warm compress" OR "heat therapy" OR "thermal treatment" OR "moist heat" "IV site rotation" OR "intravenous site" OR "venous access" OR "catheter rotation" "phlebitis" OR "vein inflammation" OR "venous inflammation" OR "phlebitis prevention"AND "nursing intervention" OR "nursing care" OR "nursing practice" OR "nursing strategy"	392
2	Scopus	"warm compress" OR "heat therapy" OR "thermal treatment" OR "moist heat" "IV site rotation" OR "intravenous site" OR "venous access" OR "catheter rotation" "phlebitis" OR "vein inflammation" OR "venous inflammation" OR "phlebitis prevention"AND "nursing intervention" OR "nursing care" OR "nursing practice" OR "nursing strategy"	98
3	PubMed	"warm compress" OR "heat therapy" OR "thermal treatment" OR "moist heat" "IV site rotation" OR "intravenous site" OR "venous access" OR "catheter rotation" "phlebitis" OR "vein inflammation" OR "venous inflammation" OR	312

		"phlebitis prevention"AND "nursing intervention" OR "nursing care" OR "nursing practice" OR "nursing strategy"	
4	Google Scholar	"warm compress" OR "heat therapy" OR "thermal treatment" OR "moist heat" "IV site rotation" OR "intravenous site" OR "venous access" OR "catheter rotation" "phlebitis" OR "vein inflammation" OR "venous inflammation" OR "phlebitis prevention"AND "nursing intervention" OR "nursing care" OR "nursing practice" OR "nursing strategy"	82
5	Web Of Science	"warm compress" OR "heat therapy" OR "thermal treatment" OR "moist heat" "IV site rotation" OR "intravenous site" OR "venous access" OR "catheter rotation" "phlebitis" OR "vein inflammation" OR "venous inflammation" OR "phlebitis prevention"AND "nursing intervention" OR "nursing care" OR "nursing practice" OR "nursing strategy"	73
6	Science Direct	"warm compress" OR "heat therapy" OR "thermal treatment" OR "moist heat" "IV site rotation" OR "intravenous site" OR "venous access" OR "catheter rotation" "phlebitis" OR "vein inflammation" OR "venous inflammation" OR "phlebitis prevention"AND "nursing intervention" OR "nursing care" OR "nursing practice" OR "nursing strategy"	453

Eligibility Criteria

The population, intervention/issue of interest, comparison, outcome, and study design (PICOS) method were applied to identify eligible studies. The complete copies of the identified articles, which are supposed to meet the inclusion and exclusion criteria based on the title, abstract, and subject description, will be obtained for data synthesis. The question research would be used in this research is "What are effective nursing interventions for preventing phlebitis in adults?"

Table 2. PICOS

Category	Inclusion Criteria	Exclusion Criteria
Population	Hospitalized adult patients with PIVC	Non-IV-related phlebitis, pediatric patien, patient with CVC
Intervention	Nursing interventions include applying warm compresses and rotating the infusion insertion site every 72-98 hours.	Without intervention standard
Comparation	Routine nursing care only	ultrasound guidance
Outcome	Reduction in phlebitis incidence, decrease infusion phlebitis	No clear outcome measure, Increase of Incidence Phlebitis
Study Design	*Randomized Controlled Trial* (RCT), Cohort Study,	Case reports, reviews, non-English papers

Based on the data PICOS, author searched the artickels to find the eligible artickels and accordance to support the research question. Criteria inclusion will become the main point that lead us to find the artickel related. The aim of the research is to find the effective interventions that nurse can implement in everyday to prevent phlebitis occurrence. Another complication occurs when the PIVC catheter is in the incorrect location or the medication leaks into the surrounding tissue, which causes tissue damage and pain to the patient (Cho & Kim, 2025).

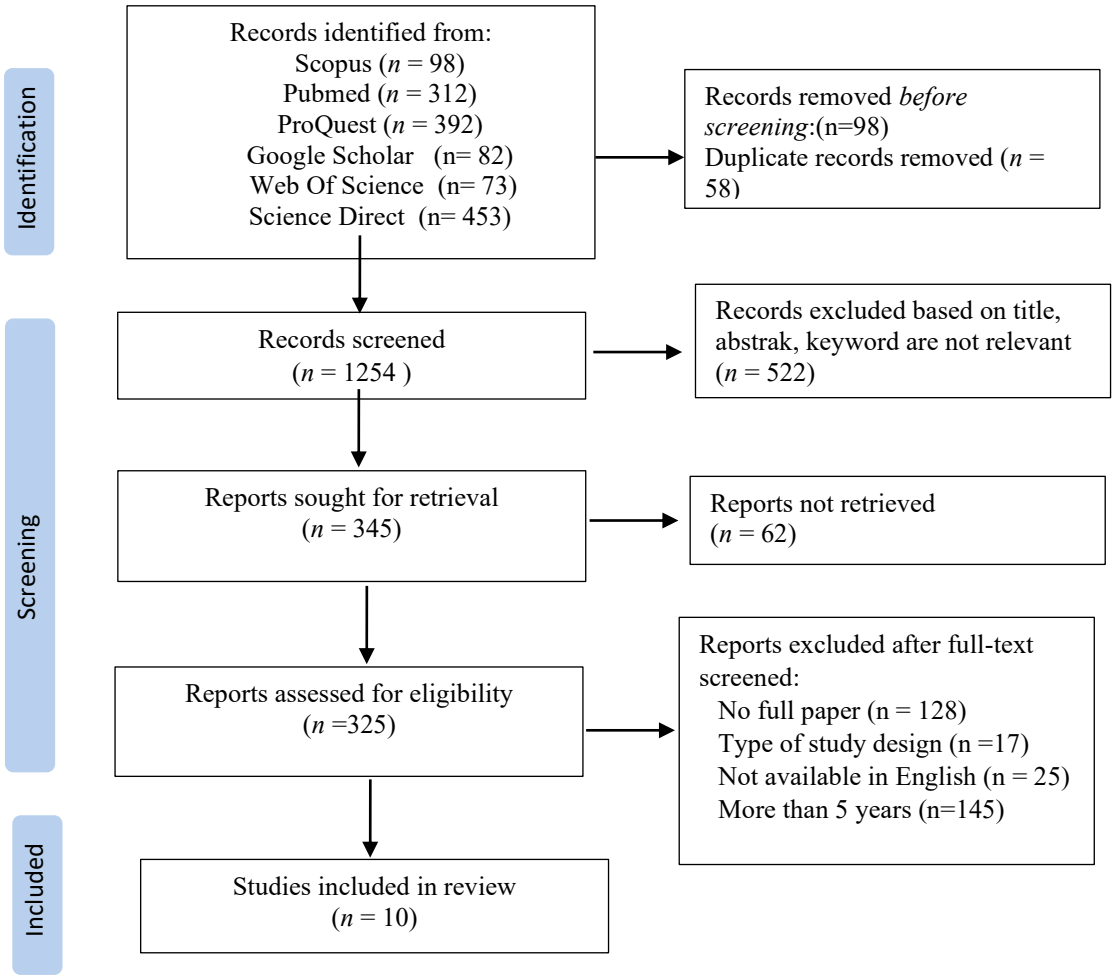

Figure 1. PRISMA flowchart

Study selection and data extraction

Artickels was identify 1410 artickels, and after that will be screened based on the criteria inclusi and exclusi, until got the artickels eligible to be extracted 10 artickels. The appraisal methodology used in this study is using the JBI RCT consisting of 13 appraisal points. There are 10 articles with RCT research designs that get a score of over > 70% that meet the standard score criteria of > 75% JBI Cohort Study are worthy of being used as supporting articles in research.

Checklist for JBI

Table 3. Quality Assesment with JBI

NO	Author, Country and Year	Study Design	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	Scoring Dalam %
1	Fatma Aksoy,et.al-Turkey 2023	RCT	√	X	√	X	X	√	√	√	√	√	√	√	√	10/13 (76.92%)
2	P. Vendramim., et.al. Brazil 2020	RCT	√	√	√	X	X	X	√	√	√	√	√	√	√	10/13 (76.92%)

3	Sevda Korkut, et.al. Germany 2020	RCT	√	√	√	X	X	X	√	√	√	√	√	√	√	10/13 (76.92%)
4	Linfang Zhao.,et.al. China 2025	RCT	√	√	√	X	X	X	√	√	X	√	√	√	√	9/13 (69.23 %)
5	Rudolf Mörgeli, et.al. Germany 2022	RCT	√	√	√	X	X	0	√	√	√	√	√	√	√	10/13 (76.92%)
6	Simon L. Thomsen, MD;:, et.al. Germany 2022	RCT	√	X	√	X	X	X	√	√	√	√	√	√	√	9/13 (69.23 %)
7	Adriana Moreira, et.al. Brazil 2021	RCT	√	X	√	X	X	X	√	√	√	√	√	√	√	9/13 (69.23 %)
8	Hugh Davies,et.al. Australia 2024	RCT	√	√	√	X	X	X	√	√	√	√	√	√	√	10/13 (76.92 %)
9	Ajay Singh Sarsar ,et.al. India 2019	RCT	√	0	√	X	X	0	√	√	√	√	√	√	√	9/1 (69.23 %)
10	Linda Kerr,et.al. California 2022	RCT	√	√	√	X	X	√	√	√	√	√	√	√	√	11/13 (84.61%)

√ = Yes (1), X = No (0), 0 = unclear (-)

Critical appraisal tool is used JBI with 13 questions because JBI is well-known for evidence-based healthcare research, lending credibility to the tool. Each question Q1 & Q6 aim to selection bias, Q2, Q3 & Q7 aim to measurement bias, Q4 & Q5 for confounding bias and control, Q8, Q9 & Q10 for follow up and attrition bias and Q11 aim to statistical appropriateness. The advantages of use JBI that has systematic approached, comprehensive coverage of bias risks, promotes transparency, and applicable to various research contexts. But disadvantages are lack of quantitative scoring, subjectivity in interpretation, limited guidance of confounding factors, and not designed for certain complex design.

RESULT AND DISCUSSION

There are 7 articles with the quality of research with over 70 % that are around 76.92% until 84.61 % and there are 4 artickels with the quality of research with under 70 % that are around 69.23 %. The Author still took the artickels with the quality 69.23 % or it means the quality is mild, because the researches were used the step by step systematic of I with design RCT. Took the artickel with the mild quality will be a weakness of the systematic review but as the process and the intervention result, it will be eligible to be reference.

Artickel that we found should be an artickel with the high quality. We extract the artickel one by one to and there are 3 artickels from data base Scopus, 3 artickel from data base ProQuest, 1 artickel from data base PubMed, 1 artickel from data base Science Direct, 1 artickel from data base Web Of Science, 1 artickel from data base Google scholar.

Fatma Aksoy,et.al-Turkey, 2023 with the title artickel "The effect of warm moist compresses in peripheral intravenous catheter-related has claimed that phlebitis can be prevent by Intervention warm moist compresses applied at 28°C for 15 minutes, 3 times daily for 3 days (started 24 hours post-phlebitis detection to avoid exacerbating inflammation) and the result of research was Phlebitis grade: Decreased in both groups, but no statistically significant difference between control and experimental groups (p=0.109 for final grade). Conclusion: Warm moist compresses (28°C, 3x/day for 3 days) significantly improved phlebitis symptoms (redness, edema, pain) in palliative patients, though phlebitis grade reduction was comparable to routine care alone. The artickel has quality research 76.92%. same as the research by P. Vendramim., et.al. Brazil, 2020.

Sevda Korkut, et.al. Germany , 2020 with the title "The Effectiveness of Local Hot and Cold Applications on Peripheral Intravenous Catheterization: A Randomized Controlled Trial" with Total sample : 90 patients and each group: 30 patients (Hot Application, Cold Application, Control). Intervention (I): Application of a hot pack (Intervention Group I) or a cold pack (Intervention Group II) to the inner surface of the forearm (catheter insertion site) for 1 minute immediately before PVC insertion. Conclusion Summary: Both hot and cold applications reduced pain vs. no application. However, only hot application reduced anxiety, improved vein visibility, shortened insertion time, reduced insertion difficulty, and increased patient satisfaction. Cold application worsened vein visibility, prolonged insertion time, increased difficulty, and decreased satisfaction.

Ajay Singh Sarsar ,et.al. India, 2019 with the title " An Experimental Study to Assess the Effect of Moist Heat Therapy on Ease of Peripheral Venous Cannulation among Patients Admitted in Selected Hospital of Ambala" from data base Web Of Science, claimed the intervention is very specific: moist heat application with precise temperature (39-40°C) and duration (2x5min). Control group got no such intervention. Both groups had forearm cannulation attempts, mostly on cephalic vein. Because the intervention targets is difficult venous access. Sample size is smaller than the previous study – only 60 total, 30 per group. Population (P)

Adult patients (18–60 years) admitted to medical/surgical wards in a hospital in Ambala, Haryana, India, elective peripheral venous cannulation (PVC) on the forearm with low vein visibility/palpability (Vein Assessment Score ≤3). The result of the research claimed that Moist heat therapy significantly improved vein visibility/palpability, reduced pain during cannulation, higher first-attempt success (93.3% vs. 56.7%), faster cannulation (167 seconds saved on average).

Linfang Zhao.,et.al. China, 2025 with the title "Differences in catheter-related complications to insertion site selection for long peripheral intravenous catheters in antimicrobial therapy: a randomized controlled trial" from data base ProQuest in 2025 did the intervention about Long PIVC insertion in the upper arm (ultrasound-guided, 3 Fr, 8 cm catheter via over-the-needle technique). The sample size started with 90 participants (45 per group) but ended with 83 after exclusions.

The results strongly favor upper arm insertion for reducing thrombophlebitis and extending catheter duration. The author emphazised that we should care to the site to insert the catheter and the duration of insertion intrevnous catheter, 741nstru 72-84 hours should be prepare the change of catheter and it means that replacing the catheter is necessary be attention and be observation by nurse in the ward. Conclusion: Upper arm insertion significantly reduces thrombophlebitis risk and extends catheter dwell time during antimicrobial therapy, without increasing procedural difficulty.

P. Vendramim., et.al. Brazil, 2020 with the title "The RESPECT trial–Replacement of peripheral intravenous catheters according to clinical reasons or every 96 hours: A randomized, controlled, non-inferiority trial" with the sample size is straightforward: 1319 total, 672 in intervention vs 647 control. The intervention is clinically indicated removal while comparison is routine 96-hour replacement. Conclusion: Clinically indicated replacement was non-inferior to 96-hour routine replacement for phlebitis prevention and reduced phlebitis rates per catheter-day. However, it was associated with higher pain and infiltration events.

Simon L. Thomsen, MD;:, et.al. Germany, 2022 with the title "Safety and Efficacy of Midline vs Peripherally Inserted Central Catheters Among Adults Receiving IV Therapy A Randomized Clinical Trial by data base ProQuest and did Intervention (I) Midline catheter (MC; Vygon Seldipur Smartmidline), length 15 cm (median), inserted into upper arm veins (basilic, cephalic, or brachial) and site insertion recommended are Site of Insertion Upper arm veins: Basilic (84.2% MC, 91.5% PICC), Brachial (13.2% MC, 5.9% PICC), Cephalic (2.6% both groups) and be aware of the Other complications: Pain during infusion (MC: 1.3%), infiltration (MC: 1.3%).

Linda Kerr,et.al. California, 2022, with the title "The effect of three different nonpharmacological methods on cannulation success during peripheral intravenous catheter placement in the emergency unit: a randomized controlled trial by data base Google Scholar. The intervention shown that we have to attention to the Site of InsertionPrimary: Antecubital fossa (80.3%). Other Sites: Basilic (4.8%), cephalic (6.1%), dorsal metacarpal (5.4%), accessory veins (0.7%), Arm Preference: Right arm (61.9%). The author suggested the 741nstrument like near-infrared (NIR) light visualization,to help find the venous peripheral. Some others way can be choosen by nurse to support their task to insert PICC.

The prevention, early diagnosis and treatment of phlebitis constitute a fundamental part of the healthcare work of the nursing profession (Garcia-Expósito et al., 2023).When nurses found the difficult to insert the catheter Intravenous, it has so many tools that can be used to overcome the problem. Through the result of the artickels that presented the way to inserted the catheter intravenous, it can help nurses in their daily activity to served the patient and get the medication and nutrition very well. Intervention of prevented phlebitis are include applying warm compresses and rotating the infusion insertion site every 72-98 hours are recommended to implemented by nurse, so it woul be a part to evaluate how effective those interventions and can be adopted. Some hospital or health care should implemented by their strategy but, the artickel has shown the good result and how it can reduced the phlebitis incidence.

CONCLUSION

Insertion of peripheral venous access is the most common invasive hospital procedure, essential for surgical patients, with early *phlebitis* detection critical for timely interventions to

minimize complications (Sou et al., 2017; Anne Mercado & Paul Musco, 2022). Nurses play a pivotal role in prevention through monitoring peripheral IV administration, developing guidelines, and fostering a disciplined safety culture influenced by their perceptions, professionalism, and organizational factors (Kaphan et al., 2024a; Park & Choi, 2025). Effective strategies include clinically indicated catheter replacement, which matches routine 96-hour replacement in preventing *phlebitis* but may increase pain and infiltration, and warm moist compresses (28°C, 3x/day for 3 days), which alleviate symptoms like redness and pain comparably to routine care (Yasuda, 2022). *Phlebitis* often stems from mechanical irritation by catheters in mobile sites like the hand or forearm, particularly with oversized gauges, underscoring the need for nurses' expertise in vein characteristics, therapies, catheter selection, and *PIVC* insertion training. For future research, longitudinal studies could evaluate the long-term impact of nurse training programs combined with organizational culture interventions on *phlebitis* incidence rates in diverse hospital settings.

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