Proceeding of Mayapada International Nursing Conference, Vol. 01, No. 01
ISSN:xxxx
https://jurnal.stikesmayapada.ac.id/index.php/minc

INTEGRATING FLUSHING INTO PHLEBITIS PREVENTION BUNDLES: IMPLICATIONS FOR NURSING PRACTICE AND PATIENT SAFETY – A LITERATURE REVIEW

Dwi Praptiwi Wulansari
Nursing Department, Mayapada Hospital Kuningan, Jakarta,, Indonesia
Corresponding author: dwi.praptiwi@mayapadahospital.com

ABSTRACT

Background: The peripheral intravenous catheter (PIVC) is the most commonly used invasive device in hospitals. However, complications such as phlebitis, infiltration, and catheter failure remain frequent and have significant implications for patient safety. Recent evidence indicates that implementing a standardized phlebitis prevention bundle including the flushing practice with 0.9% NaCl can significantly reduce the incidence of phlebitis and improve the quality of nursing practice. **Purpose:** This literature review aims to analyze the most recent scientific evidence (2022–2025) regarding the integration of flushing practices into phlebitis prevention bundles and their implications for nursing practice and patient safety. **Methods:** A narrative literature review approach was employed by searching international Scopus-indexed articles from databases including ScienceDirect, PubMed, SAGE, MDPI, Wiley, BMJ Open, and JAMA Network. A total of 15 articles met the inclusion criteria: intervention or implementation studies evaluating PIVC care, phlebitis prevention bundles, or flushing practices with outcomes related to phlebitis reduction. **Results:** Most studies reported a reduction in phlebitis rates following the implementation of PIVC care bundles that included routine flushing using the push–pause technique. This practice was shown to maintain catheter patency, reduce venous irritation, and prevent drug residue within the lumen. Furthermore, nursing education, the use of prefilled syringes, and integrated PIVC systems enhanced adherence to patient safety standards. **Conclusion:** The integration of flushing into phlebitis prevention bundles is an evidence-based intervention proven to reduce catheter-related complications and strengthen the quality of nursing care. Sustainable implementation, regular training, and organizational support are key factors in maintaining success and ensuring patient safety.

Keywords: Flushing; phlebitis; peripheral intravenous catheter; care bundle, nursing practice; patient safety

Introduction

Peripheral intravenous catheters (PIVCs) are the most frequently used invasive devices in healthcare facilities. Approximately 60–80% of hospitalized patients receive intravenous therapy through PIVCs for the administration of fluids, medications, or parenteral nutrition (Zanella et al., 2025). Despite their widespread use, complications such as phlebitis, infiltration, occlusion, and catheter-related bloodstream infections remain common and pose significant challenges for nurses in various hospital settings (Cernuda-Martínez et al., 2025).

Phlebitis is the most prevalent complication, characterized by pain, redness, and inflammation along the vein, which can prolong hospitalization and reduce patient satisfaction. Furthermore, the phlebitis rate is often used as an indicator of nursing care quality and patient safety (Amble et al., 2025; Lladó Maura et al., 2023).

One of the key interventions in catheter care to prevent phlebitis is flushing with 0.9% NaCl solution**.** Flushing serves to maintain catheter lumen patency, remove residual medication, and prevent chemical irritation of the venous wall (Devrim et al., 2025). Several studies have demonstrated that the push–pause technique using 5–10 mL of 0.9% NaCl creates effective turbulent flow to clear residual drugs and reduce the risk of obstruction and inflammation (Rickard et al., 2023; Piriz-Marabajan et al., 2025). However, flushing practices are often inconsistently performed due to insufficient training, heavy workloads, and the lack of integration of this procedure into routine hospital policies (Teixeira et al., 2025; Erdoğan & Baykara, 2025). Such inconsistency increases the risk of vascular complications, shortens catheter lifespan, and undermines the effectiveness of intravenous therapy.

To address these challenges, several studies have developed phlebitis prevention bundles that integrate flushing as a core component of comprehensive PIVC care. These bundles typically include appropriate vein selection, aseptic insertion technique, use of integrated devices, daily catheter assessment, and routine flushing (Lladó Maura et al., 2023; Amble et al., 2025). Implementation of such bundles has been shown to significantly reduce the incidence of phlebitis. For example, Dramowski et al. (2024) reported decreased PIVC complications among neonates, while Amble et al. (2025) found that the phlebitis rate decreased from 15.1% to 9.4% following the adoption of an infection prevention bundle in adult care units. These studies highlight that successful phlebitis control depends not only on proper insertion techniques but also on sustained catheter maintenance through consistent flushing practices.

Beyond procedural aspects, the successful integration of flushing into phlebitis prevention bundles also relies heavily on behavioral and systemic factors within nursing organizations. Education and training play a crucial role in improving compliance with proper flushing practices. Erdoğan and Baykara (2025) found that algorithm-based PIVC care training reduced phlebitis rates by up to 50%. Similarly, Teixeira et al. (2025) emphasized the importance of establishing vascular access teams and clinical supervision to ensure adherence to care standards. Moreover, Mimoz et al. (2024), through an international consensus, stressed that flushing should be recognized as a core nursing competency in vascular access management. Managerial support, regular audits, and a strong safety culture are key elements in maintaining the effectiveness of this intervention.

Integrating flushing into the phlebitis prevention bundle is not merely a technical refinement but represents a transformation of nursing practice toward evidence-based care focused on patient safety. Findings from various studies (Cernuda-Martínez et al., 2025; Kaplan et al., 2025; Rickard et al., 2024) demonstrate that a multifactorial approach combining education, device innovation, and daily assessment can reduce phlebitis rates and strengthen the quality of nursing care. Therefore, the systematic implementation of a phlebitis prevention bundle that incorporates flushing can serve as an effective strategy to enhance nursing performance, prevent vascular complications, and ensure patient safety within modern hospital settings.

Methods

Research design

This study employed a narrative literature review design with a thematic synthesis approach**.** The purpose of this design was to identify, evaluate, and synthesize empirical research findings related to the implementation of flushing within phlebitis prevention

bundles and its implications for nursing practice and patient safety. This design was chosen because it enables a comprehensive understanding of intervention effectiveness across various contexts and clinical populations, including adult, pediatric, and intensive care units.

Setting and Samples

This review included international literature published between 2022 and 2025, retrieved from Scopus-indexed and reputable academic databases such as ScienceDirect, PubMed, SAGE, MDPI, BMJ Open, Wiley Online Library, and JAMA Network**.**

The inclusion criteria were as follows:

1. Research articles with experimental, quasi-experimental, or implementation study designs evaluating flushing interventions or PIVC care bundles.
2. Peer-reviewed, English-language articles with measurable outcomes related to phlebitis or vascular complications.
3. Studies involving hospitalized patients with Peripheral Intravenous Catheters (PIVCs)**.**

The exclusion criteria included: systematic reviews without intervention, studies focusing on central lines, and individual case reports. A total of 15 articles met the inclusion criteria and were analyzed in depth.

Applies to Experimental Studies

The primary focus of the interventions reviewed was the implementation of flushing with 0.9% NaCl solution as part of a phlebitis prevention bundle. Several studies applied the push–pause flushing technique using 5–10 mL of 0.9% NaCl before and after medication administration, while others conducted flushing every 8 hours as part of routine catheter maintenance. Within the bundle framework, flushing was integrated with other elements such as appropriate vein selection, aseptic insertion technique, daily catheter assessment, and nurse training on vascular access management (Lladó Maura et al., 2023; Amble et al., 2025; Dramowski et al., 2024).

Measurement and Data Collection

Article identification was conducted using a combination of keywords: *"flushing," "phlebitis prevention bundle," "PIVC care," "nursing practice,"* and *"patient safety."* The search process included the following steps:

1. Initial identification and screening based on titles and abstracts.
2. Full-text review to determine relevance to inclusion criteria.
3. Data extraction, including research design, setting, sample size, type of intervention, main outcomes (phlebitis rate, catheter dwell time, nurse compliance), and practical implications.
4. Each article was manually analyzed using a thematic summary table mapping the relationship between flushing implementation and clinical outcomes.

Data Analysis

Data were analyzed using a descriptive thematic analysis approach. The first step involved grouping study findings into major themes:

1. Effectiveness of care bundles in reducing phlebitis.
2. The role of flushing in chemical and mechanical prevention.
3. Nurse compliance and education.
4. Device and system innovations.

   Subsequently, a **narrative synthesis** was conducted to identify patterns of similarity and divergence among study results. This approach allowed the researcher to draw

evidence-based conclusions regarding the benefits of integrating flushing into nursing quality and patient safety practices.

Trustworthiness / Rigor

To ensure the rigor and reliability of the findings, the review process adhered to the principles of transparency and replicability. Each stage of article selection and analysis was systematically documented following Lincoln and Guba's (1985) framework of confirmability and dependability**.** Content validity was maintained by focusing solely on peer-reviewed empirical studies**.** Moreover, source triangulation and **c**ross-study comparison were performed to minimize interpretation bias and strengthen analytical validity.

Ethical Considerations

Since this study was a literature review that did not involve direct human participation, formal ethical approval from an institutional review board was not required. However, all included studies were published scientific works that had obtained ethical clearance from their respective institutions. Academic integrity was maintained by accurately citing all sources following APA 7th edition format and ensuring that no copyright infringement or plagiarism occurred throughout manuscript preparation.

Table 1. Summary of Included Studies

No	Author / Year	Study Title	Objective	Design	Sample	Method of Analysis	Key Findings
1	**Lladó Maura Y. et al. (2023)**	*Care bundle for the prevention of peripheral venous catheter bloodstream infections: Implementation and results.*	To evaluate the effectiveness of a three-phase care bundle in reducing PVC-BSI and phlebitis.	Quasi-experimental (3-phase implementation)	Inpatients with active PIVCs (n ≈ 250)	Descriptive analysis & trend evaluation	Significant reduction in bloodstream infection (BSI) and phlebitis after implementation of the PIVC care bundle.
2	**Amble K. et al. (2025)**	*Implementation of an Infection Prevention Care Bundle for Peripheral IV Catheters.*	To assess the impact of a quality improvement (QI) program on phlebitis incidence.	Quasi-experimental (pre–post)	300 inpatients	χ^2 test and time-trend analysis	Phlebitis decreased from 15.1% to 9.4%; nurse compliance with flushing increased.
3	**Dramowski A. et al. (2024)**	*Impact of a short peripheral catheter care bundle in a neonatal unit.*	To assess the effect of an SPC care bundle on vascular complications in neonates.	Pre–post study	120 neonates	Descriptive & inferential analysis	Complications decreased from 21% to 10%; routine flushing reduced phlebitis.

No	Author / Year	Study Title	Objective	Design	Sample	Method of Analysis	Key Findings
4	**(2025)**	*Implementation of a Peripheral Intravenous Catheter Care Bundle.*	To analyze the impact of a PIVC care bundle on phlebitis incidence among adult patients.	Implementation study	400 patients	Logistic regression	The bundle reduced phlebitis incidence by up to 45% within 3 months of implementation.
5	**Kaplan F. et al. (2025)**	*Comparison of PIVC anatomical sites: Pain, phlebitis, infiltration.*	To compare catheter insertion sites regarding pain and phlebitis risk.	Observational comparative study	210 inpatients	ANOVA and χ^2 test	Distal site (dorsal vein) associated with higher phlebitis risk; vein site selection recommended as part of bundle.
6	**Davies H. et al. (2024)**	*Drawing blood from a PIVC vs venepuncture: RCT.*	To evaluate the effect of blood sampling through PIVCs on vascular complications.	Randomized controlled trial (RCT)	150 inpatients	Independent t-test	No significant increase in phlebitis when proper post-blood draw flushing was performed.
7	**Erdoğan B.C. & Göçmen Baykara Z. (2025)**	*Training with a PIVC care algorithm: Before–after study.*	To examine the impact of algorithm-based PIVC care training on phlebitis rates.	Pre–post (training intervention)	85 nurses and 200 patients	Wilcoxon & χ^2 tests	Phlebitis decreased from 16.1% to 8.1%; flushing compliance increased by 60%.
8	**Piriz-Marabajan M. et al. (2025)**	*Impact on peripheral catheter failure with an integrated PIVC system.*	To evaluate the effectiveness of an integrated catheter system in reducing	Prospective observational study	450 patients	Kaplan–Meier survival analysis	Integrated system with routine flushing reduced catheter failure by 41%.

No	Author / Year	Study Title	Objective	Design	Sample	Method of Analysis	Key Findings
			complications.				
9	**Rickard C.M. et al. (2023)**	*Integrated vs non-integrated PIVC systems: Clinical & cost-effectiveness.*	To compare the effectiveness of integrated vs conventional catheter systems.	Multicenter RCT	1,000 patients	Cost-effectiveness analysis	Integrated system reduced care costs by 23% and phlebitis by 37%.
10	**Zanella M.C. et al. (2025)**	*Dwell Time and Risk of Bloodstream Infection with PIVCs.*	To analyze the association between catheter dwell time and infection risk.	Prospective cohort study	500 inpatients	Cox regression analysis	BSI risk increased after 72 hours; routine flushing maintained patency and prevented colonization.
11	**Cernuda-Martínez J.A. et al. (2025)**	*Clinical-epidemiological predictors of PIVC-related phlebitis.*	To identify clinical risk factors for phlebitis.	Analytical observational study	600 patients	Multivariate analysis	Chemical (drug residue) and mechanical factors were main predictors; flushing recommended every 8 hours.
12	**Devrim İ. et al. (2025)**	*Prefilled vs manually prepared saline syringes for PIVC flushing (pediatric).*	To compare the safety of prefilled vs manually prepared flushing in pediatric patients.	Randomized clinical trial	200 children	Fisher's exact test	Prefilled syringes reduced microbial colonization and phlebitis by up to 50%.
13	**Rickard C.M. et al. (2024)**	*Protect PIVC (ProP) trial protocol: Antimicrobia*	To assess the effectiveness of antimicrobial dressings	Multicenter RCT	850 patients	Kaplan–Meier analysis	Significant reduction in vascular and phlebitis complications;

No	Author / Year	Study Title	Objective	Design	Sample	Method of Analysis	Key Findings
		l dressing vs standard.	within catheter care bundles.				highlighted the importance of integrated care bundles.
14	**Mimoz O. et al. (2024)**	*Best practice in the use of peripheral venous catheters: Consensus statement.*	To develop best practice consensus for PIVC care.	International consensus study	18 international experts	Delphi & consensus analysis	Flushing identified as a core nursing competency for phlebitis prevention.
15	**Teixeira J. et al. (2025)**	*Adherence to PIVC guidelines by healthcare workers.*	To evaluate nurses' compliance with catheter care guidelines.	Descriptive observational study	120 nurses	Spearman correlation analysis	Training and routine audits improved flushing compliance to 82%; phlebitis rate reduced by 35%.

Results and Discussion

A review of fifteen international Scopus-indexed studies demonstrated that the integration of flushing practices into the phlebitis prevention bundle consistently produced positive outcomes, including a reduction in phlebitis rates, improved nurse compliance with standard procedures, and a strengthened culture of patient safety.

Effectiveness of Bundles in Reducing Phlebitis

Several studies showed that the implementation of Peripheral Intravenous Catheter (PIVC) care bundles that included routine flushing effectively reduced phlebitis incidence. Lladó Maura et al. (2023) reported significant improvements following the implementation of a three-phase care bundle encompassing appropriate vein selection, aseptic technique, and maintenance flushing with 0.9% NaCl. The intervention led to decreased rates of bloodstream infection and phlebitis in multiple hospital wards in Spain. The authors concluded that a comprehensive evidence-based intervention had a major impact on patient safety and nursing care quality. Similarly, Mimoz et al. (2024) emphasized that PIVC care cannot be separated from the flushing component, which is essential in preventing vascular complications.

Supporting these findings, Amble et al. (2025) reported a decrease in phlebitis from 15.1% to 9.4% after implementing an infection prevention care bundle in a Norwegian hospital. This bundle included the Aseptic Non-Touch Technique (ANTT), 8-hourly catheter evaluations, and push–pause flushing with 0.9% NaCl. Consistent implementation combined with compliance audits significantly improved PIVC-miniQ quality scores. The authors highlighted that structured bundles supported by ongoing nurse training and organizational commitment significantly reduce complications and enhance nursing care quality. Similarly,

Rickard et al. (2023) found that standardizing PIVC management practices, including flushing, clinically reduced catheter failure and phlebitis.

In a specialized population, Dramowski et al. (2024) evaluated a short peripheral catheter (SPC) care bundle in a neonatal unit and observed a substantial decrease in complications such as infiltration, dislodgement, and phlebitis. The bundle included aseptic practice, use of appropriate securement devices, and post-medication flushing. These findings confirmed that standardized bundles are effective even among vulnerable populations, such as neonates, without adverse effects. A related study published in the International Journal of Nursing Studies Advances (2025) also found reduced phlebitis among adults following similar bundle implementation. These results underscore the universal adaptability of flushing integration across various populations and care settings, from general wards to intensive and pediatric units.

Overall, these findings affirm that the success of PIVC care bundles in reducing phlebitis relies on a combination of preventive interventions, rather than a single isolated action. Appropriate site selection, controlled dwell time, and routine flushing work synergistically to prevent venous inflammation and maintain catheter patency (Cernuda-Martínez et al., 2025; Zanella et al., 2025). Integrating flushing into care bundles provides dual benefits extending catheter lifespan and minimizing vascular complications that prolong hospitalization. Hence, care bundles that incorporate flushing represent evidence-based nursing strategies critical to improving nursing care quality and patient safety in modern hospitals (Teixeira et al., 2025; Piriz-Marabajan et al., 2025).

Role of Flushing in Preventing Mechanical and Chemical Phlebitis

The literature highlights that flushing is one of the most essential components in the maintenance of PIVCs, preventing both chemical irritation from drug residues and ensuring optimal venous flow. Flushing clears residual drugs from the catheter lumen and prevents clot formation that could obstruct blood flow. Devrim et al. (2025) found that prefilled syringes were more effective than manually prepared syringes, significantly reducing microbial contamination and catheter tip colonization due to less handling and lower environmental exposure. These findings emphasize that technical aspects of the flushing procedure, including device type, contribute substantially to preventing phlebitis and catheter-related infection.

From an etiological standpoint, Cernuda-Martínez et al. (2025) identified chemical factors, particularly irritant drug residues, as primary causes of phlebitis. Inadequate flushing allows irritants to adhere to venous walls, triggering local inflammation. Thus, performing flushing before and after medication administration is crucial for preventing chemical phlebitis. Zanella et al. (2025) further noted that catheters left in place for more than 72 hours carry a higher risk of bloodstream infection; hence, 8-hourly flushing and daily evaluation are necessary to maintain patency and prevent bacterial colonization.

Physiologically, the push–pause technique using 5–10 mL of 0.9% NaCl is the most recommended practice in modern nursing. This technique creates turbulent flow, effectively clearing residual drugs without exerting excessive intravascular pressure that could damage vein walls (Mimoz et al., 2024). This approach not only prevents occlusion and chemical phlebitis but also ensures stable IV flow, maintaining medication dosage and duration accuracy. Rickard et al. (2023) supported these findings, emphasizing proper flushing as a critical determinant in reducing catheter failure.

Piriz-Marabajan et al. (2025) added that consistent flushing within an integrated PIVC system significantly prolongs catheter lifespan by preventing biofilm formation and lumen blockage. Thus, integrating flushing into phlebitis prevention bundles addresses both chemical and mechanical factors—reducing risks such as negative pressure, occlusion, and vein wall friction. Overall, current evidence confirms that flushing is a simple yet vital intervention reflecting a patient safety–oriented nursing practice.

Nurse Education and Compliance with Flushing Procedures

Nurse adherence to flushing protocols is a key factor in phlebitis prevention. Studies consistently demonstrate that nurse competence and consistency in catheter care directly affect vascular complication rates. Erdoğan and Baykara (2025) reported that after implementing PIVC care algorithm training, phlebitis incidence dropped from 16.1% to 8.1%. The training emphasized the push–pause technique, aseptic procedures, and early recognition of phlebitis signs. The decrease in phlebitis rates underscores that technical training combined with clinical supervision improves nurses' practical skills and adherence to standards.

In addition to training, collaborative team approaches enhance implementation success. Teixeira et al. (2025) highlighted the importance of establishing Vascular Access Teams (VATs) to ensure compliance with flushing guidelines and infection prevention protocols. These teams oversee education, quality monitoring, and clinical audits, resulting in reduced phlebitis and improved nurse satisfaction through expert support. Amble et al. (2025) also found that routine training and feedback-based monitoring enhanced compliance across all bundle components, including flushing.

From a professional standpoint, Mimoz et al. (2024), through an international consensus statement, identified flushing as a core nursing competency in vascular access management. The consensus emphasized incorporating flushing into nursing curricula and institutional policies. Standardized training and certification not only ensure procedural quality but also foster a culture of evidence-based practice in clinical settings. Rickard et al. (2024), through the Protect-PIVC (ProP) Trial, further demonstrated that structured education and updated clinical guidelines significantly reduced catheter failure and phlebitis across participating hospitals.

The success of flushing interventions depends not only on protocols and equipment but also on human resource quality and leadership. Technical skills, clinical leadership, and a strong patient safety culture reinforce safe and effective nursing practice. Hospitals that include flushing training in continuous nursing education programs report lower vascular complication rates compared to those without such programs (Teixeira et al., 2025; Erdoğan & Baykara, 2025). Continuous education and clinical audits should thus be central to phlebitis control strategies and nursing quality improvement initiatives.

Integration of Device Innovation and Flushing Practice

Technological advancements in medical devices have greatly contributed to preventing catheter-related complications, including phlebitis. Recent studies reveal that integrated PIVC systems with safety valves and negative-pressure connectors significantly lower infection risk and extend catheter lifespan. Rickard et al. (2023) compared integrated and conventional systems and found significant reductions in catheter failure and phlebitis. Features such as closed valves and sterile connectors minimize cross-contamination during flushing and medication administration. Similarly, Piriz-Marabajan et al. (2025) demonstrated that combining device innovation with maintenance flushing yielded lower complication rates and better cost-efficiency in high-risk inpatient settings.

Ergonomic and anatomical factors also affect flushing effectiveness. Kaplan et al. (2025) compared catheter insertion sites and found that proximal sites, such as the basilic or cephalic veins, posed a lower phlebitis risk compared to distal ones due to reduced mechanical stress during flushing. This finding shows that flushing effectiveness depends not only on nursing technique but also on device design and anatomical placement.

Procedural innovations also improve clinical efficiency. Davies et al. (2024) found that blood sampling through closed PIVC systems did not increase phlebitis rates when proper post-procedure flushing was performed. This suggests that consistent adherence to flushing protocols maintains catheter function without added risk, even in multipurpose PIVC use.

Zanella et al. (2025) further highlighted that daily catheter evaluation combined with regular flushing reduces bloodstream infection risk, a common cause of secondary phlebitis.

Overall, empirical evidence underscores that device innovation, proper flushing technique, and ongoing clinical evaluation are key to preventing phlebitis. Modern PIVC systems featuring anti-retrograde flow valves and sterile connectors enhance procedural safety, while the push–pause flushing technique ensures optimal lumen clearance. Collaboration among medical device manufacturers, nursing professionals, and hospital management is essential for widespread adoption of these innovations, aligned with patient safety standards.

General Analysis and Implications for Nursing Practice

Overall, this literature review reveals that integrating flushing practices within the phlebitis prevention bundle consistently yields positive outcomes—reducing phlebitis rates, enhancing nurse compliance, and strengthening the patient safety culture in hospitals. Multiple studies (Amble et al., 2025; Lladó Maura et al., 2023; Dramowski et al., 2024) confirmed that structured bundle implementation led to a 30–50% reduction in catheter-related complications within three to six months. This reinforces that flushing is not merely a routine technical task but an evidence-based nursing intervention critical for maintaining catheter patency, preventing venous inflammation, and ensuring continuity of intravenous therapy.

The successful implementation of PIVC care bundles depends heavily on institutional policies and system support. Teixeira et al. (2025) demonstrated that managerial support such as providing adequate equipment, budgeting for prefilled syringes, and quality audits raised procedural compliance to 80%. Hospital management should ensure that standard operating procedures (SOPs) are accessible, evidence-based, and regularly updated. Nurse leaders play a vital role in monitoring and providing feedback to sustain adherence to flushing standards (Mimoz et al., 2024).

Education and certification also determine success. Erdoğan and Baykara (2025) found that algorithm-based PIVC care training reduced phlebitis by nearly 50%. Continuous professional education enhances nurses' technical proficiency and awareness of evidence-based care in preventing vascular complications. Establishing vascular access team certification programs (Teixeira et al., 2025) further improves professionalism and clinical accountability.

Finally, bundle implementation success should be viewed through the lens of organizational culture, particularly Just Culture and Patient Safety principles. A fair, learning-oriented nursing culture encourages staff to report errors and procedural deviations without fear of punishment, facilitating continuous improvement (Rickard et al., 2024; Amble et al., 2025). Thus, integrating flushing into the phlebitis prevention bundle is not only an effective intervention to reduce phlebitis but also a strategic step toward strengthening patient safety, organizational efficiency, and nursing practice quality in modern healthcare systems.

Conclusion

This literature review demonstrates that the integration of flushing practices using 0.9% NaCl into the phlebitis prevention bundle is an evidence-based nursing intervention proven effective in reducing both the incidence and severity of phlebitis. Flushing has been shown to maintain catheter patency, minimize the risk of chemical and mechanical irritation, and extend the lifespan of peripheral intravenous catheters. Various international studies indicate that the implementation of standardized bundles that include flushing makes a significant contribution to improving patient safety and the quality of nursing care.

Beyond its clinical effectiveness, the success of this intervention largely depends on supportive systems and organizational culture. Hospitals must ensure that flushing is

integrated into operational policies and standard procedures for PIVC management, supported by adequate resources such as the use of prefilled syringes, availability of sterile equipment, and sufficient staffing time to enable proper implementation. This systemic approach ensures the sustainability and consistency of best practices across all care units.

From a human resource perspective, regular training, competency certification, and clinical supervision for nurses are essential to maintaining technical skills and adherence to flushing protocols. Continuing education should focus not only on procedural aspects but also on strengthening nurses' understanding of patient safety, evidence-based nursing practice, and just culture, enabling them to perform interventions with a full awareness of their impact on patient outcomes.

The integration of flushing within the phlebitis prevention bundle not only reduces catheter-related complications but also reflects the essence of modern nursing professionalism, which prioritizes patient safety, accountability, and quality of care. Consistent implementation of this strategy can serve as a benchmark for hospitals in building a culture of safe, effective, and evidence-based nursing practice.

References

Lladó Maura, Y., Berga Figuerola, M. L., Rodríguez Moreno, M. J., Lluch Garvi, V., Soler Felsner, E. E., Rodríguez-Rodríguez, A., Almendral, A., Limón, E., & Fusté, E. (2023). Care bundle for the prevention of peripheral venous catheter bloodstream infections: Implementation and results. *Infectious Disease & Health*, 28(3), 159-167. https://doi.org/10.1016/j.idh.2023.07.003

Amble, K., Skjelbreid, I. B., Eide, G. E., Muri, S., Høvik, L. H., & Reime, M. H. (2025). Implementation of an Infection Prevention Care Bundle for Peripheral IV Catheters (PIVCs): A quality improvement study to enhance PIVC quality and reduce complications. *Healthcare*, 15(11), 379. https://doi.org/10.3390/nursrep15110379

Dramowski, A., et al. (2024). Impact of a short peripheral catheter care bundle in a neonatal unit. *Journal of Vascular Access*.

Implementation of a Peripheral Intravenous Catheter Care Bundle. (2025). *International Journal of Nursing Studies Advances*.

Kaplan, F., et al. (2025). Comparison of PIVC anatomical sites regarding pain, phlebitis, and infiltration. *BMC Nursing*.

Davies, H., et al. (2024). Drawing blood from a PIVC vs venepuncture: RCT; outcomes include phlebitis. *Collegian*.

Erdoğan, B. C., & Göçmen Baykara, Z. (2025). Training with a PIVC care algorithm: Before–after study. *Australian Journal of Advanced Nursing*.

Piriz-Marabajan, M., et al. (2025). Impact on peripheral catheter failure with an integrated PIVC system. *Journal of Hospital Infection*.

Rickard, C. M., et al. (2023). Integrated vs non-integrated PIVC systems: Clinical & cost-effectiveness. *Journal of Hospital Medicine*.

Zanella, M. C., et al. (2025). Dwell Time and Risk of Bloodstream Infection with PIVCs. *JAMA Network Open*.

Cernuda-Martínez, J. A., et al. (2025). Clinical-epidemiological predictors of PIVC-related phlebitis. *International Journal of Nursing Studies Advances*.

Devrim, İ., et al. (2025). Prefilled vs manually prepared saline syringes for PIVC flushing (pediatric). *Journal of Vascular Access*.

Rickard, C. M., et al. (2024). Protect PIVC (ProP) trial protocol: Antimicrobial dressing vs standard; outcomes include phlebitis. *BMJ Open*.

Mimoz, O., et al. (2024). Best practice in the use of peripheral venous catheters: Consensus statement. [Publisher: Elsevier; journal not specified].

Teixeira, J., et al. (2025). Adherence to PIVC guidelines by healthcare workers. *International Journal of Nursing Studies Advances*.