

Nurse-Led Interventions in the Comprehensive Management of Patients Undergoing Percutaneous Coronary Intervention (PCI): A Systematic Review

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ABSTRACT

Background: Nurses play an important role in monitoring and early detection of complications, as well as in managing patients after Percutaneous Coronary Intervention (PCI) to improve clinical outcomes. Previous randomized reviews have mainly focused on physician-led or multidisciplinary PCI care, with limited attention to nurse-led management. Therefore, this review evaluated whether nurse-led interventions across the PCI care continuum provide additional clinical and patient-reported benefits compared with usual care. **Methods:** This study employed a systematic review design and was conducted using four databases: ProQuest, ScienceDirect, EBSCO, and PubMed. The PICO framework was adopted to guide the search strategy, and the PRISMA guidelines were followed. All selected articles were assessed in terms of quality using the Joanna Briggs Institute critical appraisal tools. **Results:** Based on the search results, 1,412 articles were identified. After removal of duplicates and screening of titles, abstracts, and full texts, 25 articles were included in the final synthesis, comprising 7 articles from ScienceDirect, 14 articles from ProQuest, 2 articles from EBSCO, and 2 articles from PubMed. These articles consisted of randomized controlled trials, cohort studies, and cross-sectional studies. They were categorized into interventions during assessment, pre-PCI procedures, post-PCI procedures, and follow-up care and rehabilitation. **Conclusion:** This study shows that structured, evidence-based nurse-led interventions significantly improve outcomes in patients undergoing PCI. The findings demonstrated that this model generated was associated with low Major Adverse Cardiovascular Events (MACE) (1.52%) and mortality (0.46%) through structured assessment, reduced anxiety, enhanced procedural readiness ($p < 0.05$), improved self-care behaviors ($p < 0.05$), and promotion of recovery and quality of life. Further multicenter studies with long-term follow-up are recommended to validate and generalize these findings across diverse healthcare settings.

Keywords: *Coronary Heart Disease; Nurse-Led; Nursing Practice; Percutaneous Coronary Intervention*

INTRODUCTION

The implementation of early Percutaneous Coronary Intervention (PCI) in individuals diagnosed with coronary heart disease is associated with favorable results and enhanced clinical outcomes (Dong *et al.*, 2022). Research findings indicate that PCI as an initial treatment strategy has better outcomes compared to pharmacotherapy in reducing mortality and myocardial infarction (Kandaswamy & Zuo, 2018; Zhang & Qi, 2021). As the number of patients with coronary heart disease undergoing cardiac catheterization increases, the risk of bleeding also increases. A study by Galli *et al.* (2022) noted that although PCI is a safe procedure, the risk of post-procedure bleeding still needs to be considered. Effective care management for post-PCI patients requires close collaboration among members of a multidisciplinary team (Price *et al.*, 2024). Evidence from a study involving 32 emergency nurses found that nurses perform most critical bedside tasks in coronary heart disease management, including rapid triage, ECG acquisition, IV access, medication administration, and continuous monitoring, demonstrating that effective Acute Coronary Syndrome (ACS) and PCI care relies on strong multidisciplinary collaboration in which nurses play a central and indispensable role (Wihastuti *et al.*, 2019). This is supported by recent studies that emphasize the vital role of nurses in monitoring patients, detecting

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complications early, and delivering appropriate post-PCI care, contributing to greater patient safety, improved recovery, and higher satisfaction (Qiu, 2024; Zhang & Qi, 2021).

With the increasing number of patients undergoing PCI and the complexity of the disease, continuous care using a nurse-led care model is essential for achieving better clinical outcomes. Several studies have discussed nurse-led models in cardiovascular disease management, but few have addressed the interventions or roles of nurses in PCI management. Previous reviews, such as the one by Coronas-Watkins *et al.* (2021), focused mainly on nurse-led clinics during the early discharge period, while retrospective studies such as that by Ibrahim *et al.* (2019) examined selected clinical outcomes without addressing the full continuum of care. More recent works, such as Qiu (2024), provide a broad narrative overview but lack a structured synthesis across PCI phases. Consequently, there remains a limited understanding of how nurse-led interventions function across the entire PCI trajectory, from pre-procedural assessment and preparation to post-procedural management, long-term follow-up, and rehabilitation. This systematic review addresses the gap by providing a comprehensive, multi-phase synthesis of nurse-led interventions across the PCI continuum. Unlike previous studies that examined isolated aspects of care, this review integrates evidence across care stages, intervention modalities, and outcome domains, including clinical outcomes, health behaviors, and psychosocial well-being. By mapping interventions across the full PCI pathway, this review highlights the potential synergistic effects of continuous nurse-led care and offers a more clinically applicable framework for developing integrated PCI management models.

METHODOLOGY

Research Design

This study employs a systematic review design to identify and explore the specified topic. The methodology for conducting a comprehensive review includes several elements: formulating the research question, identifying relevant studies, selecting appropriate studies, organizing the data, synthesizing the findings, and reporting the results of the literature review (Page *et al.*, 2021). The study population consisted of individuals with stable angina, acute coronary syndrome, or unstable angina undergoing PCI. The article search strategy used a combination of MeSH terms and free-text terms based on the PICO model. For MEDLINE, MeSH terms included ("nurse-led" OR "nursing intervention" OR "nursing assessment") AND ("percutaneous coronary intervention" OR "PCI") AND ("bleeding" OR "assessment" OR "education" OR "outcomes") to obtain articles that match the objectives of the literature. Boolean operators (AND/OR) were applied to combine those keywords. In contrast to previous reviews, this study adopts a multiphase framework that categorizes nurse-led interventions into assessment, preprocedural, post procedural, and follow-up phases. This approach allows systematic comparison of intervention timing, delivery methods, and outcomes across the PCI continuum, thereby improving the interpretability and clinical relevance of the findings.

Research Questions

The research questions in this review were formulated using the PICO model (Population, Intervention, Comparator, and Outcome). According to Hosseini *et al.* (2024), every strong evidence-based study begins with a well-crafted research question. Following this principle, the PICO framework was applied to guide the development of answerable clinical questions and to ensure that the literature search, inclusion criteria, and data synthesis remain aligned with the study objectives (Hosseini *et al.*, 2024). Therefore, the research questions addressed in this review are as follows:

1. What nurse-led assessments and interventions are implemented across the PCI care continuum from pre-procedural evaluation to post-procedural rehabilitation?
2. What is the impact of nurse-led care, compared with usual care after PCI, on patient-reported outcomes such as bleeding, quality of life, satisfaction, readmission, knowledge, adherence, anxiety, and complications?

Table 1: PICO Model

Component	Criteria
Population	Patients undergoing PCI
Intervention	Nurse-led education, screening, pre/post procedure, post procedural follow-up
Comparison	Usual care or no intervention
Outcomes	Bleeding, anxiety, satisfaction, readmission, knowledge, adherence, complications

Research Criteria

The articles included in this review were selected based on predefined inclusion and exclusion criteria. From 1,412 articles, studies were screened and selected based on their relevance to the review objectives. The inclusion criteria specified that eligible studies be original research articles published in English within the past five years and focus on nurse-led interventions encompassing patient assessment, management, and discharge planning for individuals undergoing PCI. Only studies employing research designs such as randomized controlled trials, quasi-experimental studies, cohort studies, or comparative studies were included. The exclusion criteria were articles not published in English, articles for which the full text was unavailable, non-scientific articles, and studies that did not specifically address nurse-led interventions. This approach ensured that the review focused on relevant and rigorously conducted research directly related to nursing practice. Accordingly, this review was prepared in accordance with the PRISMA guidelines (Page *et al.*, 2021). The articles included in this study were obtained from ProQuest, ScienceDirect, EBSCO, and PubMed.

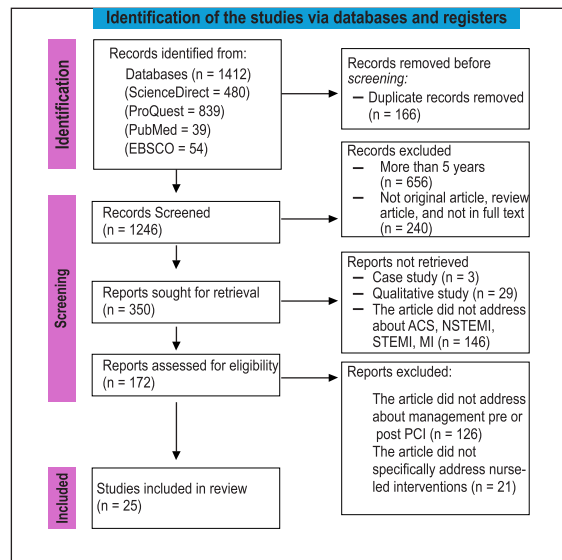


Figure 1: PRISMA Flow Diagram

Table 2: JBI Critical Appraisal Tool

References	Study Design	JBI Quality Score	Overall Methodological Quality
Chao & Li (2024)	Quasi-experimental	6/9 (67%)	Moderate
Zhao <i>et al.</i> (2025)	Quasi-experimental	9/9 (100%)	Low risk of bias
Xu <i>et al.</i> (2022)	Retrospective study	9/11 (82%)	Low risk of bias
Asgari <i>et al.</i> (2020)	RCT	7/13 (54%)	Moderate
Oshvandi <i>et al.</i> (2021)	RCT	9/13 (69%)	Moderate
Derya Ister & Altinbas (2023)	RCT	9/13 (69%)	Moderate
Shanmugalakshmi <i>et al.</i> (2023)	Case control	8/10 (80%)	Low risk of bias
Chang <i>et al.</i> (2020)	RCT	10/13 (77%)	Low risk of bias
Rejeh <i>et al.</i> (2020)	RCT	10/13 (77%)	Low risk of bias
Sarabi <i>et al.</i> (2021)	RCT	12/13 (92%)	Low risk of bias
Cao <i>et al.</i> (2022)	RCT	12/13 (92%)	Low risk of bias
Türen <i>et al.</i> (2022)	RCT	10/13 (77%)	Low risk of bias
Sallal & Mousa (2023)	Quasi-experimental study	9/9 (100%)	Low risk of bias
Sokhanvar <i>et al.</i> (2023)	RCT	10/13 (77%)	Low risk of bias
Fan & Zhou (2025)	Quasi-experimental	8/9 (89%)	Low risk of bias
Jiang <i>et al.</i> (2020)	Quasi-experimental design	9/9 (100%)	Low risk of bias
Fu <i>et al.</i> (2025)	RCT	10/13 (77%)	Low risk of bias
Peng <i>et al.</i> (2022)	Case control	7/10 (70%)	Low risk of bias
Premkumar <i>et al.</i> (2022)	RCT	9/13 (69%)	Moderate
Shi <i>et al.</i> (2022)	RCT	7/13 (54%)	Moderate
Uhm & Hwang (2023)	RCT	10/13 (77%)	Low risk of bias
Rostami <i>et al.</i> (2023)	RCT	11/13 (85%)	Low risk of bias
Bernal-Jiménez <i>et al.</i> (2024)	RCT	11/13 (85%)	Low risk of bias
Xia <i>et al.</i> (2024)	Meta analysis RCT	7/13 (54%)	Moderate
Dai <i>et al.</i> (2024)	RCT	9/13 (69%)	Moderate

Article Quality Assessment

The methodological quality of all included studies was independently assessed by two reviewers (Author 1 and Author 2) using the Joanna Briggs Institute (JBI) Critical Appraisal Tools, tailored to each study design. Any disagreements between the reviewers were resolved through discussion until consensus was reached. For descriptive purposes, an overall methodological quality classification was derived based on the proportion of JBI checklist items rated “Yes.” Studies were categorized as low risk of bias if $\geq 75\%$ of applicable items were rated “Yes,” moderate risk of bias if 50–74% were rated “Yes,” and high risk of bias if $< 50\%$ were rated “Yes.” Items rated as “Not Applicable” were excluded from the denominator.

RESULTS

Based on searches across four databases, 1,412 articles were identified using the specified keywords. After screening and eligibility assessment, 25 studies met the inclusion criteria, comprising 7 articles from ScienceDirect, 14 from ProQuest, 2 from EBSCO, and 2 from PubMed.

Research Characteristics

The articles included in this study were predominantly randomized controlled trials ($n = 17$), followed by six experimental studies ($n = 6$), one comparative study ($n = 1$), and one cohort study ($n = 1$). Participants in all included articles were patients undergoing percutaneous coronary intervention (PCI).

Types of Nursing Intervention

Based on the literature, 25 articles examined nurse-led care management in PCI. These articles were categorized into four phases: assessment interventions, pre-procedural nursing care, post-procedural management, and follow-up and rehabilitation. All nurse-led interventions were delivered by registered nurses or specialist cardiac nurses, as reported by the original authors. However, detailed information regarding nurse qualification level (e.g., Registered Nurse (RN), Advanced Practice Nurse (APN)) and formal training duration was inconsistently reported across studies.

Assessment Intervention

This review identified three articles addressing nurse-led interventions in the PCI patient assessment process. In a cohort study conducted by Xu *et al.* (2022), several important predictors that nurses must identify during assessment were reported, including length of hospital stay, Left Ventricular Ejection Fraction (LVEF), medical history of multivessel coronary heart disease, hypertension, chronic lung disease, anemia, and serum creatinine levels. These predictors can help nurses predict readmission within 30 days after PCI. In addition, the use of Euro-SCORE II in the nursing assessment process can help determine patient risk severity and guide appropriate care planning (Chao & Li, 2024). Cognitive-behavioral Beyond Euro-SCORE II, nurse-led assessment and screening may also incorporate other tools, such as the China-PAR model, which stratifies patients into several risk categories and informs individualized care plans (Zhao *et al.*, 2025). Both articles indicate that the assessment process focuses not only on cardiovascular screening but also on planning, encompassing psychological support, disease education, and follow-up, including rehabilitation. Collectively, these findings underscore that nurse-led assessments go beyond cardiovascular evaluation by incorporating psychological support, tailored education, and structured follow-up planning.

Pre-Procedure Nursing Care

The search results identified two randomized controlled trials examining acupressure prior to PCI: one by Jiang *et al.* (2020), which focused on the HT7 point, and another by Derya Ister and Altinbaş (2023), which investigated the LI4, HT7, and an additional acupoint. In addition to acupressure, three randomized controlled trials examined preprocedural education using different educational approaches. In the study by Shanmugalakshmi *et al.* (2023), computer-assisted education focused on follow-up care for patients undergoing PCI. Meanwhile, in the study by Chang *et al.* (2020), education was combined with cognitive-behavioral therapy to optimize clinical outcomes. Another study, by Oshvandi *et al.* (2021), implemented preprocedural education using video-based media. Overall, across the identified RCTs, nurse-led preprocedural interventions primarily involved acupressure and structured educational strategies. Acupressure was implemented using single-point or multi-point protocols, whereas educational interventions were delivered

through computer-assisted modules, cognitive-behavioral therapy-supported sessions, or video-based instruction. Overall, these findings indicate that nurses contribute substantially to evidence-based patient preparation and the enhancement of preprocedural readiness.

Post-Procedure Management

This review identified nine nurse-led interventions in post-PCI care, addressing pain, anxiety, quality of life, and hemodynamic status. In the pain domain, several interventions, including hand reflexology for patients undergoing PCI and gradual repositioning to a semi-sitting position after sheath removal, have been shown to reduce pain scores (Rejeh *et al.*, 2020; Sarabi *et al.*, 2021). This finding is also supported by the study from Türen *et al.* (2022), which examined the gradual elevation of the head of the bed to 30° within 1 hour after the procedure to reduce patient pain. Furthermore, pain in post-PCI patients may also be reduced through the application of an ice bag (Sokhanvar *et al.*, 2023). Several studies have employed continuous education to improve satisfaction, quality of life, and hemodynamic outcomes. In a randomized controlled trial, pre-sheath removal education significantly influenced pain scores and vital signs (Sallal & Mousa, 2023). Furthermore, an experimental study by Jiang *et al.* (2020) found that structured education on heart disease improved patients' quality of life. This finding is consistent with the study by Xia *et al.* (2024), which showed that combined mHealth and rehabilitation interventions were among the most effective interventions from the first week to 6 months post-PCI. An RCT by Fu *et al.* (2025) also found that education delivered through a combination of internet-based support and psychological counseling improved anxiety scores, quality of life, and cardiac function.

Thus, psychological support, such as acceptance and commitment therapy, has a positive effect on patient resilience after PCI (Cao *et al.*, 2022). In nursing care, the use of PDCA cycle-based interventions has significantly reduced the incidence of hematoma (Fan & Zhou, 2025). These findings demonstrated meaningful improvements in pain, anxiety, hemodynamic stability, and quality of life. Nonpharmacological methods (e.g., reflexology, gradual repositioning, and ice application) effectively reduced pain, while structured education, mHealth-supported programs, and psychological interventions improved recovery outcomes for up to six months post-PCI. In addition, PDCA-based care reduced complications such as hematoma. These findings underscore the substantial contribution of nurse-led strategies to post-PCI recovery.

Follow-up and Rehabilitation

This review identified eight articles addressing nurse-led interventions in post-PCI follow-up care and rehabilitation management. Nurse-led counseling, including conventional methods such as telephone follow-up, had a positive impact on lifestyle modification, BMI, self-care skills, and medication adherence (Premkumar *et al.*, 2022; Rostami *et al.*, 2023; Uhm & Hwang, 2023). The use of educational methods combined with application support has also been employed in PCI follow-up care, resulting in improved knowledge, physical activity, and resilience (Bernal-Jiménez *et al.*, 2024). In addition, a literature search identified nurse-led interventions in cardiac rehabilitation, with three articles reporting that nurse-led cardiac rehabilitation had positive effects on lifestyle modification, body mass index, laboratory parameters, quality of life, hemodynamic status, and psychological status (Dai *et al.*, 2024; Peng *et al.*, 2022; Xia *et al.*, 2024). In the follow-up management of patients who have undergone PCI, structured multidisciplinary collaboration led by nurses has been shown to improve physical capacity, self-efficacy, and adherence to treatment regimens (Shi *et al.*, 2022). Overall, the eight studies indicate that nurse-led follow-up and rehabilitation interventions play a critical role in improving post-PCI outcomes. Through counseling, technology-assisted education, structured cardiac rehabilitation, and multidisciplinary coordination, nurses significantly enhance patients' lifestyle behaviors, adherence, physical capacity, and overall well-being, thereby reinforcing their central contribution to long-term recovery after PCI.

Table 3: Summary of Included Primary Studies and Key Findings

No	Nurse-Led intervention or Assessment	Scope	Authors	Impact on Service	Implementation
1	Application of Predictive Nursing Based on Euro SCORE in Perioperative Period of PCI	Perioperative risk stratification	Chao & Li (2024)	Shorter length of stay, improved LVEF, higher quality of life, reduced MACE (Major Adverse Cardiac Event)	EuroSCORE II-based risk assessment, team-based care, stepwise rehab

2	Nurse-Led Cardiovascular Risk Assessment and Management Program post PCI in Hemodialysis Patients	Risk screening, psychological support, lifestyle modification	Zhao <i>et al.</i> (2025)	Improved quality of life, reduced anxiety or depression, lower cardiogenic shock incidence	China-PAR tool, tailored education, psychological support
3	Predicting 30-Day Readmission Risk Post PCI	Risk prediction, early identification	Xu <i>et al.</i> (2022)	Early detection of high-risk patients for readmission	Nomogram model applied at admission
4	Acupressure vs Aromatherapy for Sleep Quality pre-PCI	Non-pharmacological sleep quality intervention	Asgari <i>et al.</i> (2020)	Significant improvement in sleep quality (HT7 acupressure)	Acupressure intervention applied night before PCI
5	Video-based Educational Program before Transradial Coronary Angiography	Patient education	Oshvandi <i>et al.</i> (2021)	Higher satisfaction and comfort	40-min video shown 24h pre-procedure
6	Effect of Acupressure on Hemodynamics and Pain in Coronary Angiography	Non-pharmacological pain management intervention	Ister & Altinbas (2023)	Reduced pain but no effect on hemodynamic parameters	11-min acupressure session pre-procedure
7	Educational Intervention on Self-Care Knowledge Post PCI	Patient self-care education	Shanmugalakshmi <i>et al.</i> (2023)	Significant increase in self-care knowledge	Computer-assisted educational program, post-PCI
8	Nurse-led Psychological Intervention using CBT around PCI	Psychological intervention, anxiety reduction and quality of life	Chang <i>et al.</i> (2020)	Reduced anxiety, improved quality of life and chest pain frequency	Structured CBT-based sessions pre and post PCI
9	Hand Reflexology Massage Post PCI	Pain and fatigue management	Rejeh <i>et al.</i> (2020)	Significant reduction in pain and fatigue	20-min hand reflexology, post-PCI
10	Position Change for Pain and Vascular Complications Post Femoral PCI	Pain and complication reduction	Sarabi <i>et al.</i> (2021)	Reduced groin or back pain, fewer vascular complications	Gradual bed elevation post femoral PCI
11	Acceptance and Commitment Therapy for Post-PCI Patients	Psychological resilience, self-management	Cao <i>et al.</i> (2022)	Improved resilience and self-management skills	ACT sessions pre-discharge and WeChat follow-up
12	Head of Bed Elevation on Back Pain after PCI	Non-pharmacological pain management	Türen <i>et al.</i> (2022)	Reduced back pain with 30° HOB elevation	Gradual HOB elevation to 30° post-PCI
13	Interventional Program for Pain during Sheath Removal	Pain and safety during sheath removal	Sallal & Mousa (2023)	Reduced pain and vital signs stabilization	Psychological support, cold compress, Valsalva maneuver
14	Ice Bag Application to Femoral Region during PCI	Pain and vital signs management	Sokhanvar <i>et al.</i> (2023)	Reduced pain, Blood Pressure, and Heart Rate during sheath removal	Ice bag 20 min before sheath removal
15	PDCA Cycle to Reduce Forearm Hematoma Post-PCI	Quality improvement, complication reduction	Fan & Zhou (2025)	Significant reduction in forearm hematoma incidence	PDCA cycle, team nursing, continuous feedback
16	Nurse-led Individualized Self-Management Program Post-AMI PCI	Self-care, health behavior education	Jiang <i>et al.</i> (2020)	Improved health behavior and quality of life	Group education, counseling, structured phone follow-up
17	Internet+ Continuing Nursing Dual Heart Model	Psychological support, lifestyle, mHealth	Fu <i>et al.</i> (2025)	Lower anxiety or depression, higher quality of life and medication adherence	Gecko E-care platform, online counseling, telemonitoring
18	Seven-step Rehabilitation Training Program Post-AMI PCI	Rehabilitation program	Peng <i>et al.</i> (2022)	Improved LVEF, shorter length of stay, better ADL, higher quality of life	Stepwise rehab training over 7 days
19	Nurse-led Cardiac Rehabilitation Post PCI	Lifestyle modification, secondary prevention	Premkumar <i>et al.</i> (2022)	Better medication adherence, improved diet, increased physical activity	Discharge counseling, phone and monthly nurse follow-up
20	Multidisciplinary Exercise Management Post PCI	Rehabilitation, adherence	Shi <i>et al.</i> (2022)	Improved 6MWT, self-efficacy, social support, adherence	Nurse-led app-based rehab with team support
21	Risk Factor-Tailored Autonomy Enhancement Education	Motivation, resilience, self-care	Uhm & Hwang (2023)	Improved motivation, resilience, reduced BMI, and smoking	Face-to-face teleconsultation combining multimedia support
22	Telephone Counseling based on Orem's Model	Adherence, resilience	Rostami <i>et al.</i> (2023)	Improved adherence and resilience	Structured 3 calls/week for 8 weeks by nurse
23	Interactive mHealth App (EVITE) for Lifestyle Improvement Post PCI	Lifestyle, diet, physical activity	Bernal-Jiménez <i>et al.</i> (2024)	Improved Mediterranean diet adherence, physical activity, smoking cessation	Daily EVITE app monitoring and education
24	Network Meta-Analysis of CR Interventions Post PCI	Rehabilitation program	Xia <i>et al.</i> (2024)	Combination interventions (mHealth + rehab) are the most effective	Varied interventions 1 week until 6 months post PCI
25	Rehabilitation Training-based Follow-up for Pulmonary Function Post PCI	Rehab, pulmonary function, and quality of life	Dai <i>et al.</i> (2024)	Improved pulmonary function and quality of life	Personalized nurse-led rehab, WeChat videos, structured follow-up

DISCUSSION

Compared with earlier research, this review provides a more comprehensive and structured synthesis of nurse-led PCI care. For example, the review by Coronas-Watkins *et al.* (2021) primarily emphasized nurse-led clinics during the early discharge period and was therefore limited to post procedural care. Likewise, Ibrahim *et al.* (2019) evaluated clinical outcomes without detailing intervention components across different stages of care. Meanwhile, Qiu (2024) provided a general overview without a systematic phase-based synthesis. Hence, the present study integrates nurse-led interventions across the entire PCI care continuum. The findings indicate that improved outcomes are influenced not only by individual interventions but also by the continuity and coordination of care across multiple phases. This perspective provides a more comprehensive understanding of the contribution of nursing care to patient outcomes.

Assessment Intervention

The three articles analyzed underscore the importance of a comprehensive pre-PCI assessment that encompasses not only cardiovascular status but also functional capacity and prognostic risk factors. Xu *et al.* (2022) emphasized that identifying predictors such as left ventricular ejection fraction (LVEF), length of hospital stay, history of chronic disease, anemia, and serum creatinine levels can help estimate the risk of 30-day readmission. The use of risk assessment tools such as EURO-SCORE II and the China-PAR model demonstrated that instrument-based assessments can help nurses objectively classify patients and plan interventions addressing medical, psychological, and educational needs (Chao & Li, 2024; Zhao *et al.*, 2025). These findings align with the case project led by Tursi *et al.* (2025), which focused on the implementation of a nurse-led risk assessment tool for patients undergoing PCI. The study showed that the tool was used from 2022 to 2024. Among 743 PCI procedures, 88.6% were classified as non-high risk and were safely completed locally, with a low MACE rate of 1.52%, a mortality rate of 0.46%, and same-day discharge rates exceeding 80%, thereby surpassing national benchmarks. The tool enhanced clinical safety, workflow efficiency, and nurse-led monitoring across the pre-, intra-, and post-procedural phases. Although many studies reported surrogate outcomes, these outcomes remain clinically relevant, as improved adherence and early detection of complications are known determinants of Major Adverse Cardiovascular Events (MACE). Notably, several included studies reported reductions in MACE, bleeding events, and length of hospital stay, supporting the potential clinical impact of nurse-led care beyond patient-reported outcomes. Overall, these findings indicate that structured, nurse-driven risk assessment facilitates safe, high-quality elective PCI in community hospitals, with outcomes comparable to those in tertiary centers.

Pre-Procedure Nursing Care

Nurse-led preprocedural interventions demonstrated considerable variation in this review, ranging from nonpharmacological techniques such as acupuncture to multimodal educational strategies. Studies by Jiang *et al.* (2020) and Derya Ister and Altinbaş (2023) showed that stimulation of specific acupuncture points (HT7, LI4, and additional points) before PCI may reduce anxiety and improve patient comfort. Preprocedural education has also been shown to be effective, whether delivered through computer-mediated cognitive-behavioral therapy or educational videos (Chang *et al.*, 2020; Oshvandi *et al.*, 2021; Shanmugalakshmi *et al.*, 2023). Across the included studies, most interventions were initiated within 24 hours before the procedure, although their duration varied considerably. Educational interventions were most commonly delivered 30–40 minutes before the procedure, whereas complementary interventions such as aromatherapy and acupuncture were typically administered for 30–60 minutes and demonstrated clinical effectiveness within this timeframe. The heterogeneity of these methods reflects the adaptation of interventions to local contexts and resources. Nevertheless, they share the common goal of optimizing patients' physical and psychological readiness prior to the procedure. This is supported by the retrospective cohort study by Fan and Lin (2025) involving 150 patients with coronary heart disease undergoing coronary stent implantation. The study showed that perioperative comprehensive nursing care reduced anxiety, postoperative complications, hospitalization duration, and recovery time, while also improving lipid profiles and patient satisfaction. These findings support the integration of structured, evidence-based nursing interventions into standard perioperative care to optimize recovery and long-term cardiovascular outcomes.

Post-Procedure Management

The post-procedural phase emerged as the area with the most substantial body of evidence in this review.

Nine articles examined interventions targeting pain reduction, hemodynamic stability, and quality-of-life improvement. Nonpharmacological approaches, such as hand reflexology, gradual repositioning to the semi-Fowler's position, and ice pack application, were effective in alleviating pain following PCI (Rejeh *et al.*, 2020; Sarabi *et al.*, 2021; Türen *et al.*, 2022; Sokhanvar *et al.*, 2023). Ongoing educational interventions administered before arterial sheath removal have been shown to influence pain perception and promote hemodynamic stability (Sallal & Mousa, 2023). Psychological support, including Acceptance and Commitment Therapy and structured PDCA-based interventions, has been shown to enhance resilience and reduce complications such as hematoma (Cao *et al.*, 2022; Fan & Zhou, 2025). These findings indicate that nurse-led post procedural care is not only supportive but also preventive in reducing adverse events. In the studies included, nurse-led post procedural interventions varied in duration and were tailored to specific outcomes. Pain associated with arterial sheath removal was effectively managed through ice bag application approximately 20 minutes before removal, combined with nurse-led education delivered before and during the procedure, whereas patient comfort and safety were further supported by gradual head-of-bed elevation initiated 2 hours after PCI and maintained for up to 6 hours post-procedure. A recent study also showed that a nurse-led, closely monitored, integrated management model significantly improved self-care behaviors and treatment adherence ($p < 0.05$) (Qiu & Ren, 2025). Similarly, Qi *et al.* (2024) reported that nonpharmacological interventions, such as warm footbaths, repositioning, and guided relaxation, produced measurable benefits in reducing perioperative anxiety and improving patient-reported outcomes. These findings highlight the essential role of nurses in delivering evidence-based supportive therapies that enhance patient satisfaction and the overall postoperative experience.

Follow-up and Rehabilitation

At this stage, eight articles provide evidence that nurse-led interventions significantly enhance patient adherence, self-care practices, and sustained quality of life. Telephone counseling remains an effective method for monitoring and modifying patient behavior after PCI (Premkumar *et al.*, 2022; Rostami *et al.*, 2023; Uhm & Hwang, 2023). In addition, it has been clearly stated that nurse-led care can be provided using various delivery methods. Several studies have demonstrated superior outcomes when in-person care is combined with hybrid follow-up. Moreover, integrating education with digital applications extends the reach of interventions and enhances patient engagement in health management (Bernal-Jiménez *et al.*, 2024). A rehabilitation program may begin with discharge planning and extend into early cardiac rehabilitation programs, spanning from the first week after discharge through the initial six months. Nurse-led cardiac rehabilitation (Dai *et al.*, 2024; Peng *et al.*, 2022; Xia *et al.*, 2024) provides multidimensional impacts, including improvements in clinical, psychological, and lifestyle parameters. A collaborative, multidisciplinary approach has also been shown to strengthen patient self-efficacy and adherence to treatment regimens (Shi *et al.*, 2022). These findings are consistent with the meta-analysis by Guo *et al.* (2023), which included six studies involving 641 patients after PCI. The analysis showed that empowerment education significantly improved quality of life, including vitality, mental health, and physical function, and enhanced self-care ability ($p < 0.00001$). It also effectively reduced patients' anxiety levels and increased medication adherence three months after discharge ($p < 0.001$) (Guo *et al.*, 2023).

In addition, from the PCI perspective, these findings align with recent studies demonstrating that nurse-led interventions can influence outcomes beyond the acute procedure itself. The success of PCI is determined not solely by stent placement but also by secondary prevention, treatment adherence, rehabilitation, risk-factor control, and psychosocial recovery. Nurse-led care contributes to these outcomes by improving blood pressure and lipid control, smoking cessation, medication adherence, self-care behaviors, and quality of life, all of which are directly associated with a reduced risk of recurrent ischemic events, rehospitalization, and major adverse cardiovascular events after PCI (Alzhanova *et al.*, 2026; Yang *et al.*, 2026). These findings suggest that nurses should integrate empowerment-based education into cardiac rehabilitation programs to strengthen patient autonomy, promote adherence, and support holistic recovery after PCI.

Limitations

This review has several limitations. The inclusion of studies with diverse research designs may have

introduced variability in methodological quality and reduced the overall consistency of the findings. The studies included were conducted across different healthcare systems and cultural contexts, which may limit the suitability of the results to specific populations or regions. In addition, the heterogeneity of the included studies limited attribution of the observed effects to specific intervention components or nursing provider characteristics. Regarding provider roles, inconsistencies were identified, as not all studies reported this information. This variability should be acknowledged as a limitation of the existing evidence base.

Future Scope

Future research should prioritize well-designed randomized controlled trials and meta-analyses comparing nurse-led care with usual care in patients undergoing PCI, with standardized intervention reporting to reduce heterogeneity, clear specification of nursing levels, and a focus on clinically meaningful outcomes to strengthen evidence consistency and generalizability across healthcare settings. Future research should prioritize well-designed randomized controlled trials and meta-analyses comparing nurse-led care with usual care in patients undergoing PCI, with standardized intervention reporting to reduce heterogeneity, clear specification of nursing levels, and a focus on clinically meaningful outcomes to strengthen evidence consistency and generalizability across healthcare settings.

CONCLUSION

This review advances current evidence beyond fragmented evaluations of nurse-led care by presenting an integrated, phase-based model of nursing interventions across the PCI continuum of care. The findings indicate that 25 studies identified a range of structured nurse-led interventions that can contribute significantly to outcomes in patients undergoing PCI, from complication prevention to improvements in quality of life. However, the certainty of the evidence is limited by heterogeneity in intervention components, outcome measures, and study designs. The implementation of risk assessment instruments, technology integration, and psychological support may serve as a framework for delivering continuous nursing care. Comprehensive preprocedural assessments using risk stratification tools such as EURO-SCORE II and the China-PAR model enable nurses to identify prognostic factors and tailor individualized care plans. For the preprocedural phase, interventions such as acupuncture and cognitive-behavioral education were shown to significantly reduce anxiety and enhance procedural readiness. In the post procedural phase, nurse-led integrated management with close monitoring improved self-care behaviors and adherence while preventing complications through early detection. Therefore, continuity of care can be maintained through long-term follow-up, with nurse-led cardiac rehabilitation and tele counseling demonstrating sustained improvements in adherence, vitality, and quality of life.

CRedit Authorship Contribution Statement

F. N- Conceptualization and formulation on initial concept, writing the framework for original manuscript, data collecting, data interpretation and analysis, editing paper. K. K- Conceptualization and formulation on initial concepts, data interpretation, supervision and critical review. H. K- Conceptualization, formulation on initial concept and design of study, supervision, and critical review.

AI Assistance Declaration

During the preparation of this manuscript, the authors used ChatGPT and Grammarly to assist the authors for checking and refinement the academic writing. While using the technology tools, the authors critically reviewed and edited all outputs as well as verified all the contents. The authors take full responsibility and accuracy of the final manuscript.

Conflict of Interest

The authors confirm that they have no conflicts of interest to disclose.

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