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## Nursing Management to Reduce Hospital Readmissions after Percutaneous Coronary Interventions- Integrative Review

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**Nursing Management to Reduce Hospital Readmissions after Percutaneous Coronary  
Interventions - Integrative Review**

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### **Abstract**

Percutaneous coronary interventions (PCIs) are considered life-saving techniques in the event of a myocardial infarction and remains the standard of care for managing acute heart attack. Given the success of the procedures, decreased complications, and the economic advantage over open-heart surgery, coronary interventions continue to be the preferred treatment choice. However, amidst the growth and success of these procedures, readmissions after percutaneous coronary interventions have been identified and still prevails among hospitals. Hence, the goal was to conduct an integrative review to identify and synthesize literature on the interventions that help reduce readmissions after percutaneous coronary interventions and illuminate nurses' role in decreasing readmissions. The following review question guided the integrative review: What nursing interventions reduce hospital readmissions after patients undergo percutaneous coronary interventions? Whittemore and Knaf's (2005) framework was used for the integrative review. A total of eight studies, quantitative in nature, met the quality criteria to be included. Three themes related to the research questions emerged: evidence-based process interventions in place, management for women after PCI, and patient education and follow up appointments. The findings provide a clear opportunity to improve care in relative to the causes in preventing readmissions. Further research is needed to identify why females are more affected than men and to determine interventions based on those factors. Further research is also needed to assess nurse led intervention impact on readmissions for PCI.

*Keywords:* Percutaneous coronary intervention, nurse, readmission.

## **Nursing Management to Reduce Hospital Readmissions after Percutaneous Coronary Interventions-An Integrative Review**

Percutaneous coronary interventions (PCIs) are performed in cardiac catheterization laboratory setting, commonly known as cath lab, by an interventional cardiologist. These invasive procedures are performed on patients with heart disease with blocked coronary arteries using guidewires and balloon angioplasty followed by drug-eluting stents to revascularize the arteries (Bhatt, 2018). PCI is considered the primary reperfusion strategy to saving lives in the event of a heart attack (Thomas & Bates, 2017). It is critical to get the patient with acute cardiovascular disease in the cath lab to treat the target lesions on time to prevent further complications and reduce mortality (Park et al., 2019). Even in the middle of the COVID- 19 pandemic, patients underwent PCIs with providers taking appropriate safety precautions by the providers to prevent the spread of infection. These procedures are considered evidence-based practices to improve the quality of life and with the help of technology, these procedures have promising outcomes. The methods used are safe, and the procedures' success remains high with low overall complications (Tajti et al., 2018).

According to the interventional cardiology market analysis, approximately 965,000 PCI procedures were performed in the United States as of 2020 (iData Research., 2020). A similar rise in angioplasty procedures has been noted in other countries such as China, Europe, and Korea (Cook et al., 2007; Gao, 2010; Shin et al., 2019). Amidst the increased prevalence of PCI procedures, many researchers have seen a rise in readmissions following PCI procedures despite the guidelines and policies already in place by American Heart Association (Levine et al., 2013). Several studies are focused on identifying the factors for readmissions and taking measures to prevent the readmissions and indicate the problem's prevalence. Generally, in hospital setting

across the United States an average length of stay for PCI was seen ranging from 0 to 3 days.

However, the hospital stay may lengthen related to various factors that are non-cardiac related or complications from the cardiac procedures, leading to an impact to in-hospital costs.

Notably, readmission within 30 days is common and expected in PCI (Kwok et al., 2020). Readmissions after PCI, especially within 30 days, are considered a high cost on healthcare and are associated with poor outcomes and increasing burden to the healthcare service (Kwok et al., 2019). It is crucial to recognize these readmissions' nature to address the problems and the impact on the healthcare services. The 30-day readmission rates are used as a quality metric for hospitals to improve care and reduce cost. Vidula et al., (2018) also highlights that in the USA, 15.6% of Medicare patients discharged from the hospital after PCI procedure gets readmitted within 30 days. Reducing readmissions would prevent the excess Medicare spending costs. The Affordable Care Act has programs where institutions or hospitals face financial penalties for higher readmission rates for certain conditions (Vidula et al., 2018). These concerns drive the hospitals to improve care and lower costs while providing quality care to the community. In general, care could be improved and readmissions could be reduced by nurses through providing education to the patient, coordinating care with a multidisciplinary approach, and following up on the patient care.

### **Background**

The approach to repair arteries dates back to the 1980s and continues to advance steadily, increasing the efficiency of patient care. The procedure to open up the coronary arteries with balloon angioplasty was first performed in 1977 by Andres Gruentzig, a German-born physician (Barton et al., 2014). Gruentzig developed his revolutionary work building on the work of Charles Dotter, an American physician who performed an angioplasty procedure on legs in 1964

(Barton et al., 2014). To continue his efforts in the middle of facing resistance and lack of support on his findings, Gruentzig eventually moved to the United States. He started as a faculty member with Emory University School of Medicine and as a director of interventional cardiology (Sarpong, 2014). Over the years, several physician's research contribution for coronary angioplasty have made it feasible for the current generation to advance the works using modern techniques. These procedures are performed worldwide in healthcare settings and have significantly improved life quality with a higher success rate (Boston Scientific., 2021).

Percutaneous coronary interventions are considered life-saving techniques in the event of a myocardial infarction and remains the standard of care for managing acute heart attack, even amid the coronavirus disease - 2019 (Mahmud et al., 2020). The growth of PCI procedures has significantly expanded treatment options for patients in general. For the growing population of coronary artery disease patients who do not want to undergo open-heart surgery or choose to get procedures done instead of surgery, the PCI procedure is the preferred treatment choice. Given the success of the procedures, decreased complications, and the economic advantage over open-heart surgery, coronary interventions continue to be the preferred treatment choice. Reimbursement guidelines by Centers for Medicare and Medicaid are also in favor of the PCI procedures, leading to further growth in this treatment area (Box et al., 2020).

Amidst the growth and success of these procedures, readmissions after percutaneous coronary interventions have been identified and still prevails among hospitals. Cardiac-related causes such as congestive heart failure (CHF), anemia, and chronic kidney disease (CKD) lead to increased readmission rates. Several other factors in various studies connect cardiac related causes to hospital readmissions following PCIs. Other factors identified include stent thrombosis, bleeding complications, use of a less potent antiplatelet agent, medication non-compliance, and

syncope (Wasfy et al., 2014). Another notable factor seen is that younger people aged 18 to 54 years old are at a higher chance of getting readmitted thirty days after PCI than the older group aged above 55. A systematic review conducted by Kwok et al. (2020) determined that roughly about 1 in 7 patients who underwent PCI gets readmitted within 30 days due to similar cardiac-related factors.

Wasfy et al. (2014) record some of these factors as preventable and suggested creating strategies to reduce readmissions and enhance value and quality. Even though all readmissions are not preventable, an increased need for interventions and strategies point to prevention of readmission and the related financial burden. Unplanned admissions have significantly led to billions of dollars spent with Medicare suggesting changes in practice to control the cost (Cubanski & Neuman, 2017). The suggested changes to reduce the readmission rates by Medicare include the follow up with cardiologists after discharge, deliver effective and practical discharge teaching, and arrange appropriate transitions of care.

Nurses could play a pivotal role in preventing readmissions through appropriate discharge teaching and following up with the patients after discharge through telephone conversations. Early identification of patients' problems after stent placement during the hospital stay and taking appropriate measures to handle these situations at an early stage helps to prevent further post-discharge complications and improves patient outcomes. A study conducted by Tanguturi et al. (2016) sought to reduce readmissions by developing a validated risk scoring system, providing a structural format by developing discharge checklists, patient education videos, follow-up with cardiologists, and the help of a computerized system. Bedside nurses can have an essential role in effective discharge teaching on oral anticoagulant medications, other prescriptions, and educating on the importance of follow-up appointments to reduce

readmissions. A recent systematic review conducted by Coronas-Watkins et al. (2020) on a nurse-led clinic following up on patients who underwent PCI after discharges supported nurse-led clinics and the practicality for quality patient service. The review identified the potential for nurses to improve the overall well-being of patients following PCI through early education. Further research on the outcomes of these interventions was also recommended to address the issue of readmission.

To summarize, in addition to the factors associated with the increased rate of readmissions, a significant research gap was identified regarding early post-discharge support after PCI. No integrative review could be identified on the topic associated with interventions to reduce readmissions after angioplasty. Hence, my goal is to conduct an integrative review to identify and synthesize literature on interventions that help reduce readmissions after PCI and illuminate nurses' role in decreasing readmissions. The integrative review's focus will be to provide information on the factors associated with the readmissions, the suggested interventions to reduce the readmissions, and how nurses can be engaged in the important process to reduce readmissions. Therefore, the following review question that guided this review was:

What nursing interventions reduce hospital readmissions after patients undergo percutaneous coronary interventions?

### **Search Methods**

The aim of this integrative review was to explore how nursing management reduces hospital readmissions after PCI. The integrative review approach allows for integration of diverse research and non-research methods to fully understand what is known about the nurse's role in reducing readmissions after PCI. Whitemore and Knafl's (2005) framework was used for increasing the quality of the integrative review. This framework consists of five stages to

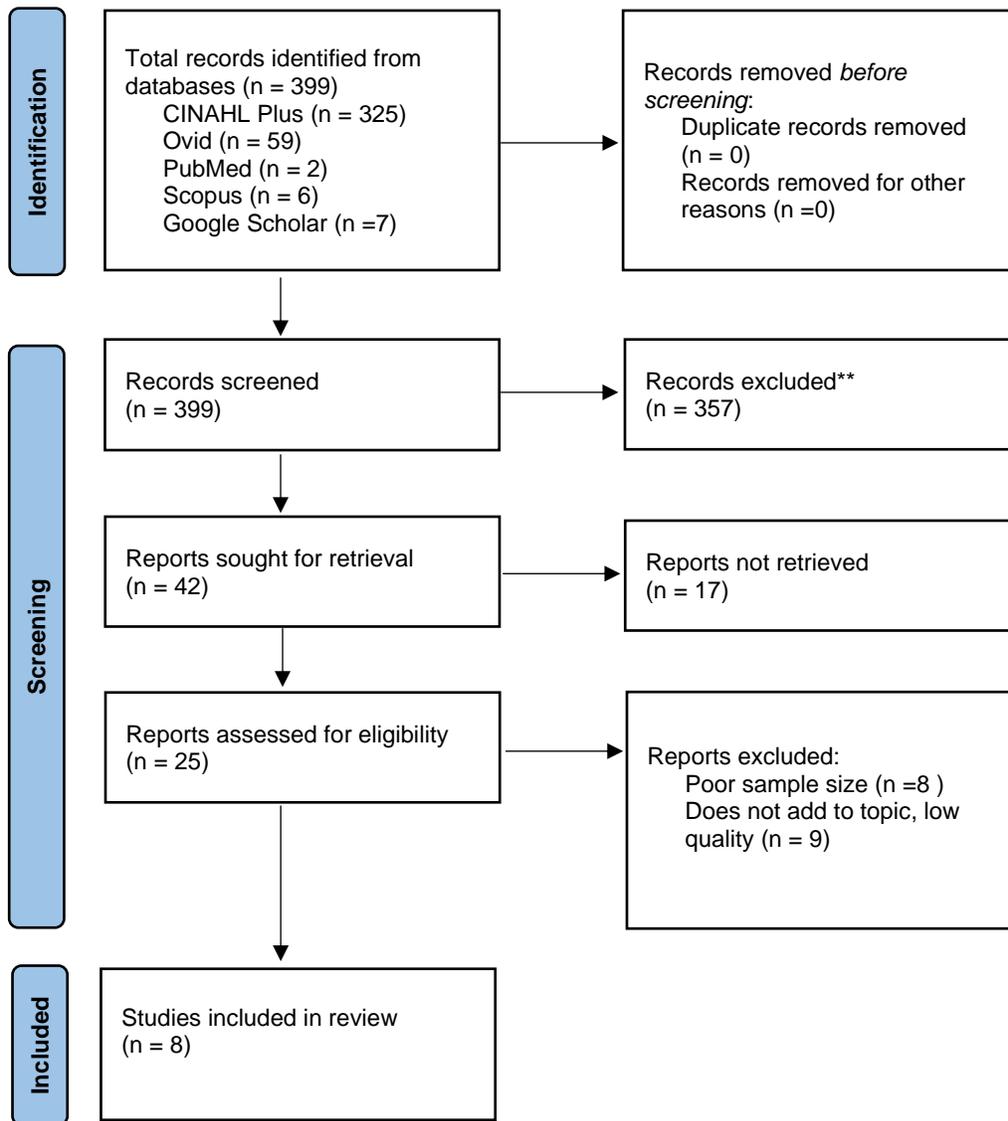
conduct the integrative review process: problem identification, systematic literature search, data evaluation, data analysis, and presentation (2005).

### **Systematic Literature Search**

Using librarian consultation, a systematic electronic literature search was conducted in several databases such as CINAHL, OVID, PubMed and Scopus. The search was conducted on July 5, 2021. The search on grey literature such as conference proceedings and dissertations was also undertaken. Keywords included percutaneous coronary intervention, nurse, and readmission. Searches were conducted using these keywords in Medical Subject Headings (MeSH), subject headings, and in the aforementioned databases to yield a large number of articles. The Boolean operators *AND* as well as advanced search techniques such as limiters in each database were used to build an effective search. In addition, Google Scholar was used to search for further relevant studies on the topic using the citation chaining technique. Inclusion criteria and exclusion criteria set boundaries for the review. The inclusion criteria for the study included full-text articles, English language, human subjects, patients who underwent PCI, peer-reviewed studies, gray literature, quantitative and qualitative study design, and hospital settings. Studies outside the United States were included to obtain an understanding of the initiatives taken by the hospitals in other countries to reduce readmissions after PCI. Studies from 2001 to 2021 were included as primary studies might be older. Systematic reviews, meta-analyses, and literature reviews were excluded. Publications in any other languages other than English were not included. A total number of 399 articles were identified through the initial search. After initial screening, 42 articles remained for thorough review. The articles that met the eligibility criteria were exported to a reference management software program (RefWorks) to remove any duplicates. No duplicates were found among the 42 articles.

### **Data Screening and Evaluation of Search Findings**

For the data screening process, the titles and abstracts of the 42 articles were reviewed to determine if the publications met the criteria. Seventeen articles were excluded after reviewing the title, abstract, and an initial rough reading of each article. The 25 articles that met the eligibility criteria were further evaluated using the John Hopkins evidence and quality criteria appraisal tools. All 25 articles were read again to obtain a general outline and identify the study design. Each article was initially rated based on the research evidence. While conducting a detailed reading of each article to identify the study design, an additional 17 articles were found to not contribute to the topic, had a small sample size and did not address the question. Hence, only eight articles met the criteria to proceed with the quality appraisal. The John Hopkins quality appraisal tool rated the articles based on high quality, good quality, and low quality. Poor quality literature was not included in the review. A PRISMA flowchart is used to display the data collection process and the results.



**Figure 1**

*PRISMA flowchart*

*Note: This PRISMA diagram illustrates the data collection process and the search results*

### Literature Data Analysis

Data analysis uses a number of steps to sort, categorize and summarize data to draw sound conclusions for the synthesis (Whittemore and Knafl, 2005). The process of data reduction

and constant comparison was used to simplify and categorize the data from the primary articles. The eight articles included in the review were read once again to obtain a general outline. Following this reading, each article was read again to ensure the contents are focused on the topic. Additionally, each article was evaluated based on the qualitative and quantitative criteria.

The John Hopkins research evidence appraisal and summary tool (Dang & Dearholt, 2018) was used to evaluate articles with a resultant review matrix created to abstract the data from the reviewed articles with a thorough approach. Steps were taken to include the review questions on the top of each matrix to ensure findings of each study are specifically relative. Examination of data across the review matrix, identified repeated patterns. These patterns became categories for analysis and helped identify unifying themes in answer to review questions. The findings were analyzed for consistent patterns, themes, and relationships. All the information was displayed and compared within the matrix to aid in the synthesis the information and enable conclusions. Refer to Table 1 for the evidence summary documentation.

### **Results**

Analysis of the eight articles revealed that identifying the factors that causes the readmissions and addressing these causative factors can help reduce readmissions after PCI. The aim of the review paper was to explore nursing interventions that reduce readmissions after PCI. And the results related to the research question was found in the form of themes. The following sections describe the findings, beginning with an explanation of the study characteristics, baseline patient characteristics associated with readmissions, and followed by a description of the three themes.

### **Study Characteristics**

All the eight studies included were quantitative in nature – one was a longitudinal observational study (Mathews et al., 2015), two were randomized controlled trials (RCT's) (Spitzer et al., 2017; Mols et al., 2019), and the final six were cohort studies (Kwok et al., 2021; Sykes et al., 2021; Biswas et al., 2020; O'Brien et al., 2017; Minges et al., 2017). Five studies were conducted in United States (Mathews et al., 2015; Kwok et al., 2021; Sykes et al., 2021; O'Brien et al., 2017; Minges et al., 2017), one study in Denmark (Mols et al., 2019), one large study conducted in five European countries and Israel (Spitzer et al., 2017), and the remaining one study was conducted in Australia (Biswas et al., 2020).

All the studies took place between 2007 and 2019 and the sample sizes varied from a total of 1455 participants for RCT's, 7425 participants for the observational longitudinal study, and more than four million participants from a nationwide readmission database in the United States. All participants underwent PCI in hospital settings, were 18 years and older, with the mean age ranging from 62.5 years (Spitzer et al., 2017) to 72.5 years (Minges et al., 2017). All studies performed statistical analysis to calculate the rates of readmissions and discover the patterns with readmissions.

### **Baseline Patient Characteristics Associated with Readmissions**

Several factors were identified that caused readmissions after PCI, such as older age (Kwok et al., 2021), female gender (O'Brien et al., 2017; Biswas et al., 2020; Sykes et al., 2020; Kwok et al., 2021), comorbidities such as chronic kidney disease, renal failure, diabetes, heart failure, anemia (Kwok et al., 2021; Biswas et al., 2020; Sykes et al., 2021), lower medication adherence to dual antiplatelet therapy ( Mathews et al., 2015), and recurrent chest pain, mostly cardiac in nature (Spitzer et al., 2017; Kwok et al., 2021; Biswas et al., 2020). Recurrent chest

pain, cardiac and noncardiac in nature was identified as one of the common reasons for readmissions after PCI. (Spitzer et al., 2017; Kwok et al., 2021; Sykes et al., 2021; Biswas et al., 2020). Gastrointestinal (GI) bleeding was another frequent noncardiac cause of readmissions noted among patients who were discharged home on oral anticoagulants and readmitted with gastrointestinal bleeding (Spitzer et al., 2017; Biswas et al., 2020; Kwok et al., 2021; Sykes et al., 2020). Interestingly throughout all studies, history of smoking in participants after PCI procedures were considered but was not identified as a cause of readmissions within 30 days. One study showed patients who were readmitted once for coronary artery disease including angina, heart failure and acute myocardial infarction, were readmitted again multiple times for similar problems at 30 and 180 days after PCI (Kwok et al., 2021).

### **Themes**

Three themes of emerged as results to answer the research question: (a) evidence-based process in place, (b) management for women after PCI, and (c) patient education and follow up appointments.

### ***Evidence-Based Interventions in Place***

In an effort to study patient characteristics for readmissions, Kwok et al. (2021) found the cost of multiple readmissions ranges from \$60,000 at 30-day follow up to \$86,000 at 180-day follow up, which indicates the significant economic and clinical impact of readmissions on the healthcare sector. The study supports using a validated scoring approach that would help assess and distinguish PCI patients who are at risk for readmissions, such as comorbidities like diabetes, renal failure, history of GI bleeding, heart failure (Kwok et al., 2021). Minges et al. (2017) developed a similar validated risk prediction tool to recognize patients with highest possibility of readmissions within 30 days after PCI. The use of this tool provided information that smoothed

transition from inpatient to outpatient settings, helped to utilize the hospital resources for the patients at risk for readmissions, and noted who would benefit more from rigorous follow-up care (Minges et al., 2017).

One study conducted among five countries of Europe and Israel suggested having proper systems in emergency departments combined with noninvasive imaging techniques and laboratory tests in place to identify the life threatening to low-risk conditions to potentially avoid unnecessary readmissions (Spitzer et al., 2017). Even though chest pain may not be prevented, Kwok and colleagues (2021) suggested interventions to reduce readmissions such as patient education videos about chest pain, and providing education to seek help early, scheduling an early follow-up appointment, and having notification systems in place involving cardiologists for quick input when patients return to emergency department can potentially reduce readmissions. Sykes et al. (2021) stressed the importance of distinguishing patients with critical chest pain caused from stent thrombosis and incomplete vascularization, from non-critical chest pain through presence of persistently elevated cardiac enzymes and electrocardiogram.

Gastrointestinal bleeding was the most recurrent non-cardiac reason of readmissions related to patients discharged on oral anticoagulant therapy after PCI (Spitzer et al., 2017; Biswas et al., 2020; Kwok et al., 2021). Identifying the predictors of GI bleeding such as increasing age, previous history of GI bleeding, history of malignancy, smoking, and triple antithrombic therapy may help in identifying PCI patients who need administration of proton pump blockers (Spitzer et al., 2017). Sykes et al. (2021) suggested monitoring hemoglobin levels prior to discharge following PCI. Sykes et al. (2021), also suggested that since PCI patients receive contrast during procedure, healthcare providers should additionally monitor the

creatinine levels before discharge and ensure measure are taken to prevent kidney injury, especially for patients with history of chronic kidney disease.

### ***Management for Women after PCI***

Another interesting factor cited in multiple studies was the female gender, who were determined more likely to be readmitted compared to males for cardiac reasons after PCI procedures. Throughout the studies, 39.9% of females were readmitted for single and multiple readmissions (Kwok et al., 2021), 42.3% females associated with unplanned readmissions (Sykes et al., 2020), 23.0% readmitted more likely to be female compared to those not readmitted (Biswas et al., 2020), and 43% female readmitted within 30 days, aged between 18-64 years old (O'Brien et al., 2017). The readmitted female patients more commonly had microvascular and vasospastic angina with ischemia and no obstructive coronary artery disease (Sykes et al., 2020). In addition, females with risk for readmissions were also associated with higher economic burden, lived in lower median household income, and had comorbidities, (O'Brien et al., 2017; Biswas et al., 2020).

### ***Patient Education and Follow-up Appointments***

Mathews et al. (2015) found that patients with lower medication adherence acknowledged their limits in the skill and capability to learn about their health conditions. The patients reported difficulty in understanding written health information, signifying patients with lower medication adherence have lesser knowledge about health. Patients were also noted for difficulty in expressing the need and purposes for each discharge medications and any possible side effects from the medications that they may experience. Mathew et al. (2015) also noted among patients with medication nonadherence, they were more likely to report financial difficulties because of high medication cost. In contrast, highly medication adherent patients

reported coverage of prescribed medications costs by their insurance. Providers assessing for health literacy, explaining the possible side effects of the medicines that are prescribed at discharge, along with a tailored patient education, and pre discharge planning were associated with a better short-term adherence overall (Mathew et al., 2015).

Confirming a follow-up appointment before discharge was connected to a high degree of medication adherence and prevention of readmissions (Mathew et al., 2015; Kwok et al., 2021). Likewise, a nurse led motivational telephone intervention after the PCI discharge showed patients contacted by phone had high probability of knowing how to deal and manage symptoms of angina pectoris. (Mols et al., 2019). The study also found a significant decrease in hospital readmission rates from 16% to 8% related to nurse led telephone intervention (Mols et al., 2019). Moreover, a decline in the trend for contacts initiated by the patients themselves to physicians or hospitals was noted (Mols et al., 2019).

### **Discussion**

The purpose of this integrative review was to explore the role of the nurses in reducing hospital readmissions after PCI. It is clear that the hospitals should have well-defined evidence-based measures and tools in place to identify patients risk factors before PCI and provide targeted interventions to reduce readmissions. Hospitals have well established physician-friendly tools that uses the patient information obtained pre procedure to estimate risks (Latif, 2014). Kwok et al. (2021) suggested using a validated risk score that would help recognize PCI patients who are at risk for readmissions. The scoring system would provide a clear opportunity to improve care in relative to the causes to preventing readmissions. Additionally, the risk prediction tool developed by Minges et al. (2017) was clinically important as these types of prediction tools helps guide the healthcare providers with clinical decision making such as

suggesting involving social workers for patients with high risk for readmissions, scheduling earlier follow-up appointment with providers, requesting pharmacy to complete medication reconciliation, providing extra education based on patient needs, and arranging health programs (Minges et al., 2017). A similar study by Tanguturi et al. (2016) confirms the importance of using a validated score. The age of the patient, history of gastrointestinal bleeding, anemia, chronic kidney disease, heart failure, ejection fraction, and socioeconomic factors all should be taken into consideration when making decisions so appropriate actions could be taken to prevent worsening of the patient's condition.

Based on the increasing trend of readmissions seen among the female patients, healthcare providers should evaluate the quality of care provided to females. This was an interesting finding where more women, compared to men, were readmitted after PCI procedures. The literatures did not identify any specific reasons for this occurrence. To reduce readmissions among female patients, O'Brien et al. (2017) suggested the importance of determining the causes of identified discrepancies and develop targeted strategies and sex- specific interventions. The authors also recommend counseling about managing low- risk symptoms and chest discomfort for women after discharge, instructing patients on how to contact and follow-up with their cardiologists, and asking detailed questions regarding their chest discomfort.

Furthermore, measures such as patient education and early follow up appointments have a significant impact on patient's medication adherence and managing chest pain. The study by Mathews et al. (2015) recognized the significance of assessing the health literacy of patients when providing educational materials and written instructions on care and medications. A health literacy assessment may determine if patients are able to understand verbal and written healthcare information provided to them during the hospital stay and before discharge. Plus, the

education provided to the patients should be tailored based on their needs (Mathew et al., 2015). This is similar to the study conducted by Tanguturi and colleagues (2016) who suggested providing a computerized structured format with discharge checklists, patient education videos, and determining follow-up appointments with cardiologists, and the help of a computerized system. Smoking was not considered a risk factor for readmissions after PCI in this review (Sykes et al., 2021). The suggestion is this could have been because of smoking cessation education and modification programs in place.

Follow-up appointments aid patients in continuing to achieve treatment targets and goals through reinforcement. It also helps to assess any medication intolerance or adverse effects as well as evaluate patient understanding about new medications and to identify any gaps that might contribute to nonadherence (Mathew et al., 2015). Recommended strategies included value-based insurance design with reduced patient copayments to improve long term adherence (Mathews et al., 2015). Further actions included a discharge checklist to ensure patients have access to appropriate medications (Kwok et al., 2021), and involving social worker (Minges et al., 2017).

Another intervention that benefited patients after PCI was a 15-minute telephone consultation with nurses two to five days following same day discharge in an effort to reduce readmissions. (Mols et al., 2019). In addition, Biswas et al. (2020), supports establishing nurse-led programs that focus on detailed patient education and follow up. This type of educational intervention is discussed in a systematic review conducted by Coronas-Watkins et al. (2020) related to a nurse-led clinic following up on patients who underwent PCI post-discharges. Coronas-Watkins and colleagues (2020) also suggested nurse-led clinics helped reduce anxiety and provided important supportive measures in the beginning of the early discharge period for

making follow-up appointments. Likewise, Mathews et al. (2015) also suggested creating multimodal solutions such as telephone interventions and pharmacist involvement post discharge. Interventions are needed to bridge the gap between hospital discharge and outpatient follow-up, where patients can be more engaged in their own healthcare behaviors such as home blood pressure monitoring and routine exercises.

## **Implications**

### **Nursing Practice**

Healthcare providers may not be able to fully prevent readmissions but there is growing evidence that if we take appropriate interventions, we could prevent readmissions to a certain extent. Even though the established validated risk scores in each hospital are more physician-oriented tools, nurses could contribute by assessing patients risk factors through a thorough patient assessment, collecting history, and provide interventions and discharge teaching based on the patient's needs. For example, when a patient who had a PCI has history of heart failure, readmissions could be prevented by nurses making sure medication reconciliation is done, the heart failure coordinator is consulted for teaching, and careful titration of medications is done by the cardiologist before discharge. Appropriate explanation of the prescribed medication uses and side effects could be provided by the nurse as well. Additionally, follow-up appointments with the cardiologist could be confirmed by the nurse while reinforcing the importance of follow-up during discharge teaching. Before providing educations, nurses should determine if the patient is able to understand the instructions and has the ability to follow instructions while at home.

Some problems such as chest pain post-PCI after discharge might not be preventable, but nurses could provide patient education videos on chest pain and provide instructions on how patients can seek help to follow up with the cardiologists. In situations where a patient comes to

the emergency department with chest pain, there could be processes in place, such as an effective triage protocol, where the nurses or the emergency department physician can notify the cardiologists immediately. During the patient's hospital stay, nurses can ensure intravenous hydration protocols are in place, especially for patients with kidney disease pre and post PCI procedure. In addition, knowing the patient's creatinine level, ejection fraction, and hemoglobin level would help nurses to prevent any acute kidney injury, bleeding from the procedural access site, or gastrointestinal bleeding. Knowing these lab findings would help nurses to alert the cardiologist to order corrective measures before discharge. These practices are standardized in every hospital, however this integrative review found readmissions related to acute kidney injury, gastrointestinal bleeding, and anemia. Hence, the practice should be evaluated and reinforced to improve care and reduce readmission.

### **Education**

Research showed that telephone interventions had a progressive impact on the physical activity of the patients after discharge, a slight inclination to a healthier diet and reduction in smoking. Nurses provide educational materials and instructions to patients regarding post procedural care, discharge medications, and confirm early follow-up appointments with cardiologists. However, further effective interventions could be undertaken such as telemonitoring or nurse telephone call reminders for patients to adopt healthy behavior practices more easily. Importance should be placed on telemonitoring approaches where patients are contacted by telephone to encourage behavior lifestyle modifications and encourage self-management.

**Research**

Through this integrative review, several nursing processes such as evidence-based management, patient education and follow-up appointments have shown to reduce readmissions. However, more research on the nursing interventions needs to be conducted to see differences in readmission rates. Additional research also needs to be done to identify why females have more readmissions than men after PCI. The research findings could help develop strategies and implement interventions to decrease readmissions among women.

**Limitations**

This study has several limitations. We did not find any qualitative literature that met inclusion criteria. Even though a thorough approach was undertaken during the search process, there may be unintentionally missed research articles. In addition, practices might be different across the healthcare systems, and therefore the results might not be applicable to general settings. The strength of this review is that even though the number of articles is very limited, the reviewed articles are of good quality and reliable.

**Conclusion**

PCI is an evidence-based reperfusion strategy to restore blood flow in the event of a heart attack and helps improve the quality of life for patients. Reimbursement guidelines by the Centers for Medicare and Medicaid are also in favor of PCI procedures, leading to further growth in this area of cardiac interventions. However, many researchers have seen a rise in readmissions following PCI procedures despite the hospital guidelines and policies in place.

This integrative review provides evidence of how nursing management can reduce readmissions after percutaneous coronary interventions. Nurse led telephone consultation have shown to positively influence patients' self-management behaviors, and nurse led clinics have

reduced anxiety and provided supportive measures in the early periods after discharge.

Moreover, conducting a thorough assessment of a patient's living conditions, socioeconomic condition, and learning the risk factors and comorbidities can help nurses to alert the physicians.

This type of assessment encourages nurses to involve social workers early on to take measures based on the patient's needs and concerns. In addition, a detailed patient education plan tailored to patient needs and reinforcing the importance of follow up appointments can reduce readmissions following PCI. Lastly, further research is necessary to include more tailored treatments in the management of coronary artery disease in women, and on nurse specific interventions to reduce readmissions.

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