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# *Integrative Evidence-Based Cardiac Nursing Model Improves Clinical Recovery and Reduces Readmission in Acute and Critical Care: A Multicenter Evaluation*

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## *Abstract*

***Background:*** *Innovations in cardiac nursing, including evidence-based interventions and advanced patient management strategies, play a pivotal role in improving outcomes in acute and critical care. However, research evaluating the combined impact of standardized nursing interventions across multiple hospitals in Indonesia remains limited.*

***Objective:*** *This study aimed to assess the effectiveness of evidence-based cardiac nursing strategies in optimizing patient outcomes among acute and critical care patients across eight Type B hospitals in Indonesia.*

***Method:*** *A causal-comparative design was employed from January 2022 to January 2025, enrolling 140 patients diagnosed with acute or critical cardiac conditions. Standardized nursing interventions—including early mobilization, tailored pharmacological management, and structured patient education—were implemented uniformly across all sites. Outcome measures comprised mortality, length of hospital stay, readmission rates, and adherence to prescribed treatment. Pearson's correlation analysis was used to evaluate the relationships between nursing interventions and patient outcomes.*

***Results:*** *Implementation of evidence-based cardiac nursing strategies demonstrated a significant positive impact on patient outcomes. Early mobilization was associated with a 20% reduction in hospital stay, adherence to pharmacological management decreased readmission rates by 15%, and structured patient education improved treatment compliance by 25%. These findings highlight the synergistic effect of combined standardized interventions on multiple clinically relevant outcomes.*

***Conclusion:*** *Programmed ventricular stimulation remains a cornerstone in assessing and managing ventricular arrhythmias, with technological advancements broadening its clinical utility. Despite challenges, its integration into predictive cardiology is promising. Multicenter research is essential to standardize protocols and validate innovations for optimized clinical use.*

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## Introduction

Cardiovascular diseases (CVDs) remain the predominant cause of morbidity and mortality globally, accounting for approximately 17.9 million deaths annually, or nearly 32% of all deaths worldwide [1]. Despite advances in medical therapies and public health interventions, the burden of acute cardiac events—including myocardial infarction, congestive heart failure, and life-threatening arrhythmias—continues to challenge healthcare systems, particularly in acute and critical care settings. These conditions often present with complex, multifaceted clinical profiles, requiring rapid recognition, immediate stabilization, and continuous monitoring to prevent clinical deterioration. Early, evidence-based interventions are not only essential for immediate survival but also play a critical role in mitigating secondary complications, preserving organ function, and enhancing long-term prognosis [2,3].

In the past decade, the landscape of cardiac nursing has evolved significantly. Traditional task-oriented care models, which primarily focus on routine monitoring and medication administration, are increasingly being supplemented—or replaced—by innovative, evidence-based strategies designed to improve both physiological and psychosocial outcomes. These contemporary nursing approaches integrate up-to-date clinical guidelines, advanced monitoring technologies, and patient-centered interventions to optimize care. Notably, these strategies emphasize early mobilization to reduce immobility-related complications, individualized pharmacological management to maximize therapeutic efficacy while minimizing adverse effects, continuous hemodynamic monitoring for the early detection of subtle changes in cardiac status, structured patient education to enhance self-management and adherence, and the integration of clinical decision-support systems to facilitate rapid, evidence-informed decision-making by nurses [4,5]. Collectively, these interventions have demonstrated substantial benefits, including stabilization of vital signs, reduction of hospital-acquired complications such as arrhythmias and thromboembolic events, improvement in psychological resilience, and enhancement of patient adherence to treatment protocols [6].

The novelty of contemporary cardiac nursing lies in its multidimensional and proactive nature. Unlike traditional models that are predominantly reactive, modern evidence-based strategies anticipate potential complications, tailor interventions to individual patient profiles, and employ technology-enabled monitoring to optimize outcomes in real time. Moreover, these approaches address both physiological and psychosocial dimensions of care, recognizing that patient recovery is influenced by a combination of clinical management, emotional well-being, and health literacy. By integrating predictive analytics and decision-support tools, nurses can now identify early warning signs of deterioration, prioritize interventions, and collaborate with multidisciplinary teams to implement timely corrective actions. This integration of clinical acumen, technology, and patient-centered care represents a paradigm shift in acute cardiac nursing, underscoring its potential to transform patient outcomes on a systemic scale.

In Indonesia, Type B hospitals serve as regional referral centers for acute and critical care services, including the management of severe cardiovascular conditions. These hospitals play a pivotal role in the healthcare system by providing advanced diagnostic, interventional, and rehabilitative services that are not

routinely available in smaller facilities. However, the quality and consistency of cardiac nursing care in these hospitals are influenced by a range of systemic and institutional factors. Disparities in resource allocation, limited access to advanced monitoring equipment, variable levels of nursing expertise and training, and heterogeneity in institutional protocols can lead to inconsistencies in care delivery. These variations have significant implications for patient outcomes, as inconsistent adherence to evidence-based practices may contribute to preventable complications, prolonged hospital stays, and suboptimal recovery trajectories [7].

Addressing these gaps requires a structured, evidence-based framework that standardizes nursing practices while allowing flexibility to accommodate local resource constraints. Standardization ensures that all patients receive care aligned with international best practices, reducing variability and enhancing safety and quality. At the same time, embedding adaptability within these frameworks allows hospitals to optimize interventions based on available resources, staff competencies, and patient demographics. This dual approach—balancing standardization with context-specific flexibility—represents a critical advancement in cardiac nursing practice, offering the potential to improve both immediate and long-term patient outcomes.

Despite the recognized importance of evidence-based cardiac nursing, limited research has systematically examined the implementation of standardized nursing strategies across multiple hospital settings in Indonesia. Existing studies often focus on single-center experiences, lack longitudinal follow-up, or emphasize isolated outcomes rather than a comprehensive evaluation of multifaceted interventions. Consequently, there is a significant knowledge gap regarding how integrated, evidence-based nursing interventions influence patient outcomes at a regional or national scale. Addressing this gap is particularly important in Indonesia, where geographic and resource variability poses unique challenges to delivering equitable, high-quality cardiac care.

This study aims to systematically evaluate the impact of implementing standardized, evidence-based cardiac nursing strategies across eight Type B hospitals in Indonesia over a three-year period. By adopting a multi-center design, the study seeks to capture variations in hospital resources, nursing competencies, and patient demographics while identifying common patterns of successful interventions. The primary objectives are to assess the effectiveness of these strategies in optimizing patient outcomes—including survival rates, incidence of hospital-acquired complications, length of hospital stay, and patient-reported quality of life—and to identify best practices that can be scaled for broader implementation. Secondary objectives include evaluating the integration of advanced monitoring technologies, structured patient education programs, and decision-support systems, and examining their impact on nursing workflow, adherence to clinical guidelines, and patient engagement [2,8].

The novelty of this study lies in its comprehensive, multi-dimensional approach to cardiac nursing in a resource-variable setting. Unlike prior research that predominantly addresses isolated interventions or single-center outcomes, this study examines a holistic, system-wide implementation of standardized nursing strategies, providing actionable insights for nationwide scaling. By systematically documenting the relationship between evidence-based interventions and measurable patient outcomes, the study contributes to the development of a uniform, high-quality standard of cardiac nursing care in Indonesia. Furthermore, the integration of advanced technologies, predictive monitoring, and patient-centered education within a standardized framework represents a cutting-edge approach that aligns with international trends in acute and critical care nursing.

In addition to its practical implications, the study addresses a critical public health challenge. Cardiovascular diseases are projected to remain a leading cause of mortality and morbidity in Indonesia and globally in the coming decades, driven by demographic shifts, increasing prevalence of risk factors such as hypertension and diabetes, and lifestyle changes associated with urbanization. Implementing evidence-based, standardized cardiac nursing strategies can directly mitigate this burden by enhancing the quality of acute care, reducing preventable complications, and improving patient self-management post-discharge. Moreover, by generating robust, multi-center data, the study provides a foundation for policy development,

resource allocation, and training programs aimed at strengthening the national cardiac care infrastructure.

Finally, the findings of this study have significant implications for the professional development of nurses in Indonesia. By emphasizing adherence to evidence-based guidelines, the utilization of advanced monitoring technologies, and patient-centered care practices, the study promotes a culture of continuous learning, critical thinking, and clinical excellence. This approach not only elevates the standard of cardiac nursing practice but also enhances job satisfaction, professional identity, and the capacity of nursing teams to respond effectively to complex clinical scenarios.In summary, cardiovascular diseases continue to exert a profound impact on global and national health systems, demanding innovative and evidence-based nursing interventions. The evolution of cardiac nursing from task-oriented care to proactive, patient-centered, and technology-integrated strategies represents a transformative advancement with the potential to improve patient outcomes significantly. This study investigates the systematic implementation of standardized, evidence-based cardiac nursing strategies across multiple Type B hospitals in Indonesia, providing novel insights into best practices, implementation challenges, and measurable patient benefits. By addressing both systemic disparities and clinical complexities, this research contributes to the development of a high-quality, equitable, and sustainable standard of cardiac nursing care within the Indonesian healthcare system, aligning with international benchmarks and contemporary best practices [1–8].

## Methods

### Study Design

This study utilized a causal-comparative design to explore the relationships between evidence-based nursing interventions and patient outcomes in acute and critical cardiac care settings. The causal-comparative design, also referred to as an ex post facto approach, enables researchers to infer potential causal associations by comparing patient outcomes across groups exposed to standardized interventions versus variations in routine care practices [9]. Such a design is particularly suitable in clinical settings where randomized controlled trials may be logistically or ethically challenging, yet understanding the effect of interventions on patient outcomes remains essential. The study adhered rigorously to ethical principles outlined in the Declaration of Helsinki, with formal approval obtained from with formal approval obtained from Makassar Health Polytechnic No.: 0402/M/KEPK-PTKMS/III/2024 of all participating hospitals. Human Ethics and Consent to Participate declarations: not applicable'. All participants provided written informed consent, ensuring compliance with the principles of autonomy, beneficence, and non-maleficence [10].

### Participants

A total of 140 patients diagnosed with acute and critical cardiac conditions were enrolled in this study. The inclusion criteria targeted adults aged 18 to 75 years who were admitted with primary cardiac diagnoses, including acute myocardial infarction (AMI), congestive heart failure (CHF), and clinically significant arrhythmias. These conditions were selected due to their high prevalence, clinical severity, and potential responsiveness to structured nursing interventions.

Exclusion criteria were carefully defined to maintain patient safety and ensure the validity of outcome assessments. Patients with terminal illnesses, severe cognitive impairments, or an inability to provide informed consent were excluded, as their participation could compromise data reliability and ethical standards of research [11].

Comprehensive demographic and clinical data were systematically collected at baseline to provide a detailed characterization of the study population. Variables included age, sex, medical history, comorbidities such as hypertension and diabetes mellitus, and baseline cardiac function parameters, including ejection fraction and New York Heart Association (NYHA) functional classification. Collecting these data allowed for appropriate stratification and statistical control of potential confounding factors, thereby enhancing the precision and validity of causal inferences regarding the effects of evidence-based nursing interventions on patient outcomes.

Additionally, the collection of detailed baseline characteristics facilitated subgroup analyses to explore whether intervention effects varied across specific

patient profiles. This approach supports a more nuanced understanding of how patient demographics, comorbid conditions, and cardiac functional status may influence responsiveness to nursing interventions, ultimately informing clinical practice and guiding individualized care strategies. Interventions
To ensure intervention fidelity and consistency across eight Type B hospitals, nursing interventions were standardized in accordance with current evidence-based cardiac care guidelines. Interventions included:

### Early Mobilization

Initiation of physical activity within 24 hours of hemodynamic stabilization was emphasized to mitigate complications associated with prolonged immobility, such as deep vein thrombosis, pulmonary embolism, and skeletal muscle atrophy [12]. Mobilization protocols were individualized according to patient tolerance and included bedside exercises, assisted ambulation, and progressively increased activity levels. Nursing staff monitored patient responses closely, documenting tolerance, fatigue, and vital sign changes during each session.

### Pharmacological Management

Medications were administered according to contemporary clinical guidelines, with careful individualization based on renal function, hemodynamic status, and potential for adverse drug events [13]. Nursing responsibilities encompassed accurate drug administration, adherence monitoring, therapeutic outcome evaluation, and prompt identification of adverse reactions. This approach ensured optimal pharmacological support while maintaining patient safety.

### Patient Education

Structured education sessions aimed to enhance patient knowledge and self-management capacity. Topics included lifestyle modifications, dietary guidance, symptom recognition, medication adherence, and engagement in follow-up care [14]. Education was delivered through verbal counseling and written materials, reinforced by repeated interactions and follow-up sessions to ensure comprehension and retention. Patient understanding was continuously assessed to tailor subsequent educational interventions effectively.

### DataCollection

A combination of retrospective and prospective data collection methods was employed to ensure comprehensive capture of patient outcomes and intervention fidelity. Retrospective data were extracted from patient medical records and nursing logs, providing detailed information on prior care, baseline clinical characteristics, and documented responses to standard nursing practices. Prospective data collection involved direct clinical observations and systematic recording of patient responses to the implemented nursing interventions, allowing for real-time assessment of adherence, clinical progress, and immediate complications.

Primary outcome measures included in-hospital mortality, length of stay (LOS), and 30-day readmission rates, reflecting key indicators of patient safety, treatment efficacy, and quality of care. Secondary outcomes encompassed both objective physiological parameters, such as heart rate, blood pressure, and oxygen saturation, and process-oriented measures, including adherence to prescribed treatment protocols and completion of scheduled nursing interventions. In addition, patient-reported outcomes, such as satisfaction with care, perceived understanding of treatment plans, and engagement in self-care practices, were systematically documented to evaluate the psychosocial impact and patient-centered effectiveness of interventions [12–14].

To ensure data integrity, multiple quality assurance measures were implemented. These included double-entry verification of all extracted data, cross-validation with original medical records, and random audits of nursing logs to detect inconsistencies or omissions. Structured data collection instruments and standardized observation checklists were utilized to minimize measurement bias and inter-observer variability. Furthermore, all research personnel underwent training in data abstraction procedures, ethical considerations, and confidentiality protocols, reinforcing the reliability and reproducibility of collected data.

Collectively, these meticulous data collection strategies provided a robust foundation for statistical analysis, enabling accurate evaluation of the effects of evidence-based nursing interventions on both clinical and patient-reported outcomes. By integrating retrospective documentation with prospective monitoring,

the study ensured a comprehensive assessment of intervention impact across multiple dimensions of cardiac care.

### StatisticalAnalysis

All collected data were systematically analyzed using SPSS version 26.0 to ensure rigorous and reproducible results. Descriptive statistics, including mean, standard deviation (SD), frequency, and percentage, were calculated to provide a comprehensive summary of participants' demographic and clinical characteristics. This approach facilitated clear characterization of the study population, enabling identification of potential baseline differences and informing subsequent analytical strategies.

To examine the relationships between specific nursing interventions and patient outcomes, Pearson's correlation coefficient was employed. This statistical method quantified both the strength and direction of linear associations, providing insights into how individual interventions—such as early mobilization, pharmacological management, and patient education—were linked to key clinical endpoints, including length of stay, 30-day readmission rates, and patient-reported outcomes.

Recognizing the potential influence of confounding variables such as age, comorbidities (e.g., hypertension, diabetes mellitus), baseline cardiac function (e.g., ejection fraction, NYHA class), and sex, multivariate regression analyses were conducted. These analyses allowed for the identification of the independent effects of standardized nursing strategies on clinical and psychosocial outcomes while controlling for relevant covariates [15]. Both linear and logistic regression models were applied as appropriate based on the type and distribution of the outcome variables, enhancing the robustness and interpretability of the findings.

A two-tailed significance threshold of $p < 0.05$ was adopted for all statistical tests to ensure rigorous evaluation of statistical validity. Effect sizes and confidence intervals were also reported where applicable to provide a quantitative assessment of the magnitude and precision of observed relationships. The integration of descriptive, correlational, and multivariate analyses allowed for a comprehensive evaluation of the effectiveness of evidence-based nursing interventions, enabling both identification of statistically significant associations and interpretation of their clinical relevance.

## Results

The implementation of evidence-based cardiac nursing strategies across eight Type B hospitals demonstrated robust and statistically significant improvements in multiple patient-centered outcomes. Overall, patients who received the structured interventions exhibited enhanced clinical stability, higher treatment adherence, and accelerated recovery trajectories compared with both baseline measures and historical controls. These findings underscore the critical role of comprehensive nursing interventions in optimizing cardiac care outcomes.

### Early Mobilization

Early mobilization interventions were implemented within 24 hours of hemodynamic stabilization and included a structured regimen of guided ambulation, passive and active limb exercises, and progressive engagement in functional activities tailored to each patient's clinical status. The protocol emphasized gradual progression, beginning with in-bed exercises and advancing to sitting, standing, and short-distance ambulation under nursing supervision. This approach was designed to mitigate the physiological and functional deconditioning associated with prolonged bed rest, particularly in patients with acute and critical cardiac conditions.

The implementation of early mobilization was associated with a 20% average reduction in hospital length of stay (LOS). Beyond reducing hospitalization duration, early mobilization contributed to a lower incidence of immobility-related complications, including deep vein thrombosis, pulmonary infections, and muscle atrophy, which are common among critically ill cardiac patients. By preventing these complications, patients experienced faster restoration of physical function, improved cardiovascular endurance, and earlier readiness for discharge [16].

Table 1 presents a hospital-specific analysis of LOS reduction, demonstrating consistent benefits across all eight participating hospitals. Despite minor variations in patient demographics, comorbidities, and hospital

resources, the reductions in LOS were statistically significant and clinically meaningful. These findings underscore the reproducibility and generalizability of early mobilization protocols in diverse clinical settings, highlighting its role as an evidence-based strategy to enhance recovery in acute cardiac care.

Furthermore, early mobilization has additional psychosocial and cognitive benefits. Engaging patients in functional activities promotes autonomy, reduces anxiety and depression associated with prolonged hospitalization, and facilitates early reintegration into normal daily activities. This comprehensive benefit profile reinforces early mobilization as a core component of holistic, patient-centered cardiac nursing interventions.

**Table 1.** Effect of Early Mobilization on Length of Hospital Stay

| Hospital | N | Mean LOS (days) Before Intervention | Mean LOS (days) After Intervention | % Reduction | p-value |
|---|---|---|---|---|---|
| Hospital A | 18 | 10.5 ± 2.3 | 8.4 ± 1.8 | 20.00% | <0.01 [16] |
| Hospital B | 15 | 11.2 ± 2.7 | 8.9 ± 2.0 | 20.50% | <0.01 [16] |
| Hospital C | 17 | 10.8 ± 2.5 | 8.6 ± 2.1 | 20.40% | <0.01 [16] |
| Hospital D | 14 | 11.0 ± 2.4 | 8.8 ± 1.9 | 20.00% | <0.01 [16] |
| Hospital E | 19 | 10.7 ± 2.6 | 8.5 ± 2.0 | 20.60% | <0.01 [16] |
| Hospital F | 18 | 10.9 ± 2.3 | 8.7 ± 2.0 | 20.20% | <0.01 [16] |
| Hospital G | 20 | 11.1 ± 2.5 | 8.9 ± 2.1 | 19.80% | <0.01 [16] |
| Hospital H | 19 | 10.8 ± 2.4 | 8.6 ± 2.0 | 20.40% | <0.01 [16] |

The implementation of early mobilization protocols across eight Type B hospitals led to a consistent and statistically significant reduction in the length of hospital stay (LOS) for patients. In Hospital A, the mean LOS decreased from 10.5 ± 2.3 days before the intervention to 8.4 ± 1.8 days after, reflecting a 20.0% reduction ($p < 0.01$) [16]. Similarly, Hospital B demonstrated a reduction from 11.2 ± 2.7 days to 8.9 ± 2.0 days, corresponding to a 20.5% decrease ($p < 0.01$) [16].

Hospital C showed a comparable trend, with LOS decreasing from 10.8 ± 2.5 days to 8.6 ± 2.1 days, achieving a 20.4% reduction ($p < 0.01$) [16], while Hospital D experienced a decrease from 11.0 ± 2.4 days to 8.8 ± 1.9 days, representing a 20.0% reduction ($p < 0.01$) [16]. In Hospital E, the LOS was reduced from 10.7 ± 2.6 days to 8.5 ± 2.0 days, a 20.6% improvement ($p < 0.01$) [16], and Hospital F demonstrated a reduction from 10.9 ± 2.3 days to 8.7 ± 2.0 days, corresponding to a 20.2% decrease ($p < 0.01$) [16].

Hospital G, which had the largest patient cohort ($n = 20$), showed a slightly lower reduction of 19.8%, with LOS decreasing from 11.1 ± 2.5 days to 8.9 ± 2.1 days ($p < 0.01$) [16]. Finally, Hospital H recorded a reduction from 10.8 ± 2.4 days to 8.6 ± 2.0 days, corresponding to a 20.4% decrease ($p < 0.01$) [16].

Overall, these results indicate that early mobilization consistently reduced LOS by approximately 20% across all hospitals, highlighting the intervention's effectiveness in promoting faster functional recovery and reducing hospitalization time. The statistical significance across all sites reinforces the reproducibility and robustness of the early mobilization protocol, independent of variations in hospital size, patient demographics, and baseline LOS.

## Pharmacological Management

The integration of standardized pharmacological management protocols played a pivotal role in optimizing clinical outcomes for patients with acute and critical cardiac conditions. These protocols included timely and evidence-based titration of cardiac medications, as well as the administration of anticoagulants, antihypertens

and antiarrhythmic agents according to established clinical guidelines. By adhering to structured medication schedules and dosages, nursing and clinical teams were able to maintain hemodynamic stability, minimize fluctuations in cardiac function, and reduce the risk of medication-related adverse events.

Implementation of these protocols resulted in a 15% reduction in 30-day hospital readmission rates, indicating that consistent pharmacological management significantly improves post-discharge outcomes [17]. This reduction reflects both the prevention of acute exacerbations of cardiac conditions and enhanced long-term disease control. Standardization of medication administration ensures that patients receive optimal therapeutic levels, reduces the potential for human error, and promotes uniformity of care across multiple hospital settings.

Moreover, systematic pharmacological management has broader implications for healthcare delivery. By decreasing readmissions, hospitals can alleviate bed occupancy pressures, reduce healthcare costs, and improve overall resource allocation. It also enhances patient safety and confidence in care, as patients experience fewer complications and more predictable clinical trajectories.

These findings underscore that pharmacological management is not merely an adjunct to nursing care but a core component of evidence-based cardiac nursing strategies, working synergistically with interventions such as early mobilization and patient education to optimize both physiological outcomes and patient-centered care [17].

### Patient Education

Structured patient education programs were implemented as a core component of evidence-based cardiac nursing interventions, targeting key areas such as lifestyle modifications, recognition of early cardiac symptoms, and adherence to prescribed medication regimens. These programs were designed to empower patients and their families to actively participate in their own care, fostering self-efficacy and long-term engagement with treatment plans.

The implementation of these education programs resulted in a 25% increase in patient compliance with prescribed medication schedules and follow-up appointments, demonstrating substantial improvements in adherence behaviors [18]. Enhanced compliance was closely associated with better long-term clinical outcomes, including reduced 30-day rehospitalization rates, improved management of comorbid conditions such as hypertension and diabetes mellitus, and stabilization of overall cardiac function. These findings highlight the pivotal role of patient education in bridging the gap between hospital-based care and successful self-management at home.

To maximize understanding and engagement, education sessions employed interactive, multimodal strategies. These included verbal counseling, written informational materials, and audiovisual aids, which allowed patients to receive information through multiple channels suited to individual learning preferences. Educational content was tailored to each patient's clinical status, literacy level, and cultural background, ensuring that key messages were both accessible and actionable.

By promoting active participation in care, patient education not only improves adherence but also enhances patient confidence, satisfaction, and quality of life. When combined with other interventions, such as early mobilization and standardized pharmacological management, patient education contributes to a synergistic effect, reinforcing the overall effectiveness of cardiac nursing strategies [18].

**Table 2:** Impact of Pharmacological Management and Patient Education on Readmission and Medication Adherence

| Intervention | N | Outcome Measure | Before Intervention | After Intervention | % Improvement | p-value |
|---|---|---|---|---|---|---|
| Pharmacological Management | 140 | 30-day readmission rate | 25% | 10% | 15% reduction | <0.01 [17] |
| Patient Education | 140 | Medication adherence | 60% | 85% | 25% increase | <0.01 [18] |

The implementation of structured pharmacological management and patient education interventions demonstrated significant improvements in both clinical and behavioral outcomes among cardiac patients. Following the pharmacological management protocol, which included standardized titration and timely administration of cardiac medications, the 30-day hospital readmission rate decreased from 25% before the intervention to 10% after, representing a 15% reduction ($p < 0.01$) [17]. This finding underscores the critical role of optimized medication management in maintaining cardiac stability and preventing early post-discharge complications.

Similarly, the structured patient education program, which focused on lifestyle modification, symptom recognition, and adherence to prescribed therapy, resulted in a marked improvement in patient self-care behaviors. Medication adherence increased from 60% prior to the intervention to 85% post-intervention, reflecting a 25% improvement ($p < 0.01$) [18]. This significant enhancement in adherence indicates that patient education effectively empowers individuals to actively participate in their own care, thereby improving long-term clinical outcomes and reducing the risk of adverse events.

Overall, these results highlight that both pharmacological management and patient education are essential components of evidence-based cardiac nursing strategies. When implemented concurrently, these interventions can substantially reduce readmission rates and enhance patient engagement in self-care, contributing to better overall treatment outcomes.

### Additional Observations

Beyond the primary and secondary outcomes, several notable additional observations were documented, highlighting the broader impact of evidence-based cardiac nursing interventions. First, patient satisfaction scores improved significantly across all participating hospitals. Patients reported higher levels of confidence in their care, better understanding of treatment plans, and greater perceived support from nursing staff. These enhancements in patient experience are critical indicators of the quality of care and have been associated with improved adherence to therapeutic regimens and follow-up recommendations.

Second, the interventions contributed to a reduction in unplanned ICU transfers. By standardizing monitoring protocols, ensuring timely intervention, and promoting early detection of clinical deterioration, nurses were able to stabilize patients more effectively on general wards, preventing escalation of critical events. This outcome not only improved patient safety but also optimized the utilization of high-acuity resources within the hospital. Third, there was a notable decrease in in-hospital complications, including cardiac arrhythmias, fluid overload, and other hemodynamic instabilities. These improvements underscore the efficacy of structured nursing strategies in maintaining cardiovascular stability and preventing secondary complications that could prolong hospitalization or worsen prognosis.

Multi-center analyses further confirmed the consistency and reproducibility of these outcomes across all eight hospitals, despite variations in staffing levels, available resources, patient demographics, and baseline case-mix. This finding demonstrates that evidence-based cardiac nursing strategies are robust, scalable, and adaptable across diverse clinical environments, providing a strong foundation for the development of standardized

care protocols that can be implemented regionally or nationally.

Collectively, these observations reinforce the notion that a holistic, evidence-based approach to cardiac nursing—integrating early mobilization, pharmacological management, patient education, and vigilant monitoring—can produce substantial and consistent benefits in both clinical and patient-centered outcomes. These results support the continued integration of structured nursing interventions as a core component of acute and critical cardiac care, with the potential to enhance patient recovery, satisfaction, and overall healthcare efficiency.

## Discussion

The findings of this multi-center study corroborate existing literature emphasizing the critical role of structured, evidence-based nursing interventions in optimizing outcomes for patients with acute and critical cardiac conditions [19]. By standardizing care processes across diverse hospital settings, nurses are able to ensure consistent monitoring, timely clinical interventions, and strict adherence to established guidelines, which collectively contribute to enhanced patient safety, reduced complication rates, and improved overall clinical outcomes [20]. These results reinforce the notion that high-quality cardiac care is not solely dependent on pharmacological or procedural interventions but also hinges on systematic, protocol-driven nursing practices.

### Early Mobilization

Early mobilization, as implemented in this study, demonstrated substantial benefits in both physiological and functional domains. Initiating guided ambulation, passive and active limb exercises, and gradual functional progression within 24 hours of hemodynamic stabilization effectively prevented immobility-related complications, including deep vein thrombosis, pulmonary embolism, and hospital-acquired pneumonia [21]. Beyond reducing these acute complications, early mobilization facilitated faster restoration of functional capacity, cardiovascular endurance, and muscle strength, which are critical determinants of long-term recovery. These effects are particularly relevant for patients in intensive and critical care settings, where prolonged bed rest can exacerbate muscle atrophy, pulmonary compromise, and hemodynamic instability, thereby increasing morbidity and delaying discharge.

### Pharmacological Management

Adherence to evidence-based pharmacological management protocols, encompassing the titration of cardiac medications, administration of antiarrhythmics, and anticoagulation therapy, was associated with enhanced hemodynamic stability and a decreased incidence of adverse drug events [22]. Standardized medication protocols offer multiple benefits: they reduce the risk of human error in drug administration, ensure maintenance of therapeutic drug levels, and optimize the efficacy of treatment regimens. Furthermore, these protocols contribute to improved post-discharge outcomes by maintaining cardiac stability, minimizing early readmissions, and supporting long-term disease management.

### Patient Education

Patient education emerged as a pivotal element of the nursing intervention framework. Structured, individualized education sessions empower patients and their families to recognize early warning signs, adhere to prescribed medication schedules, implement necessary lifestyle modifications, and engage in proactive self-monitoring practices [23]. Evidence from this study demonstrates that such interventions significantly improve long-term adherence, reduce hospital readmission rates, and increase patient satisfaction with care. Additionally, patient education fosters a sense of autonomy and self-efficacy, which are critical for sustainable behavior change and the management of chronic cardiac conditions.

### Synergistic Effects of Multi-Component Interventions

Importantly, the integration of multi-component interventions—combining early mobilization, pharmacological optimization, and patient education—appears to produce a synergistic effect. Patients receiving this comprehensive approach exhibited measurable improvements in physiological outcomes, psychosocial well-being, and overall quality of life. This synergy underscores the necessity of adopting a holistic, patient-centered strategy in acute and critical cardiac care. The findings suggest that when these evidence-based interventions are systematically applied, they can generate consistent benefits across multiple

hospital settings, thereby providing a model for regional and national standardization of high-quality nursing care [19–23].

Implications for Clinical Practice and Policy

The results of this study have significant implications for both clinical practice and healthcare policy. Hospitals seeking to improve cardiac patient outcomes should prioritize the development and implementation of standardized nursing protocols that integrate mobilization, pharmacological management, and patient education. Additionally, policy frameworks supporting continuous professional development and training in evidence-based cardiac nursing are essential to ensure protocol adherence and to sustain long-term improvements in patient care quality.

## Conclusion

This study underscores the pivotal role of evidence-based strategies in optimizing outcomes for patients with acute and critical cardiac conditions. The findings demonstrate that structured interventions—including early mobilization, adherence to pharmacological management protocols, and comprehensive patient education—are strongly correlated with improvements in physiological stability, reduced complication rates, enhanced treatment adherence, and overall patient satisfaction. The multi-center implementation across eight Type B hospitals in Indonesia further highlights the feasibility and effectiveness of standardized nursing interventions in diverse clinical settings.

The observed benefits emphasize the necessity for widespread adoption of evidence-based cardiac nursing practices within healthcare institutions. Integrating these strategies into routine practice not only enhances patient safety and quality of care but also promotes consistency across different facilities, reduces variability in outcomes, and contributes to more efficient utilization of healthcare resources.

Future research should expand on these findings through longitudinal studies that evaluate the sustainability of outcomes over extended periods, assess cost-effectiveness, and examine the integration of emerging technologies such as digital health monitoring and decision-support systems in cardiac nursing. Additionally, exploring the impact of tailored interventions on patient subgroups, including elderly populations and those with multiple comorbidities, will further refine best practices and inform policy-making for cardiac care at both national and international levels.

In conclusion, evidence-based innovations in cardiac nursing represent a critical component of high-quality acute and critical care. Their systematic implementation can significantly enhance patient recovery trajectories, reduce mortality and morbidity, and establish a benchmark for excellence in nursing practice.

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