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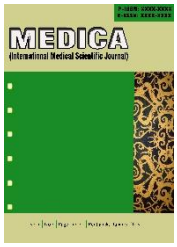

Effect of Nurse-Led Education on Knowledge and Self-Management in Patients with Acute Coronary Syndrome and Type 2 Diabetes

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Abstract

Patients with acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM) require effective self-management to reduce complications and recurrent cardiovascular events. However, evidence regarding the effectiveness of structured nurse-led education during hospitalization remains limited. This study evaluated the effect of a structured nurse-led heart and diabetes education program on knowledge and self-management among hospitalized patients with ACS and T2DM. A quasi-experimental one-group pretest–posttest study without a control group was conducted at Dr. M. Djamil General Hospital, Padang, Indonesia, between October and November 2024. Fifty eligible patients participated in a two-session nurse-led educational intervention. Knowledge and self-management were assessed at baseline and seven days after the intervention using validated instruments. Data were analyzed using paired t-tests with 95% confidence intervals and effect size estimation. Knowledge scores increased significantly from 19.96 ± 3.69 to 22.68 ± 1.70 (mean difference = 2.72; 95% CI: 2.02–3.42; $p < 0.001$; Cohen's $d = 0.94$), indicating a large educational effect. Self-management scores also improved significantly from 98.38 ± 15.30 to 100.48 ± 13.32 (mean difference = 2.10; 95% CI: 0.79–3.41; $p = 0.002$), although the effect size was small (Cohen's $d = 0.15$). These findings suggest that structured nurse-led education effectively improves disease-related knowledge and promotes early self-management among hospitalized patients with ACS and T2DM. Integrating structured educational interventions into routine discharge planning may strengthen transitional cardiometabolic care, although randomized controlled trials with longer follow-up are needed to confirm the sustainability of these outcomes.

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1. INTRODUCTION

Cardiovascular disease (CVD), particularly ischemic heart disease, remains the leading cause of death and disability worldwide, imposing substantial clinical and economic burdens (Roth et al., 2020). At the same time, the prevalence of diabetes mellitus (DM) continues to increase globally, especially in low- and middle-income countries, expanding the population at high risk for cardiovascular events and complications (Bahit et al., 2023; NCD Risk Factor Collaboration (NCD-RisC), 2024; International Diabetes Federation, 2025). Indonesia reflects this trend, with persistently high diabetes prevalence and a large population with prediabetes, emphasizing the need for effective cardiometabolic management strategies (Muharram et al., 2025).

Acute coronary syndrome (ACS), including unstable angina and myocardial infarction, is one of the most serious manifestations of coronary artery disease and requires not only evidence-based acute treatment but also comprehensive secondary prevention (Bergmark et al., 2022). Current international guidelines emphasize that optimal acute coronary syndrome (ACS) management should incorporate risk-factor control, medication adherence, lifestyle modification, and patient education to reduce recurrent cardiovascular events and improve long-term outcomes (Byrne et al., 2022; Rao et al., 2025; Virani et al., 2023). Patients with concomitant acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM) represent a particularly vulnerable population because diabetes accelerates atherosclerosis, worsens both in-hospital and post-discharge outcomes, and increases the complexity of long-term self-management through polypharmacy, glycemic control, and lifestyle modification (Jain et al., 2023; Kerola et al., 2024; Deedwania et al., 2008; Shah et al., 2024; American Diabetes Association Professional Practice Committee, 2025).

Cardiac rehabilitation and secondary prevention programs have demonstrated benefits in improving cardiovascular outcomes, yet participation and adherence remain suboptimal among patients with diabetes due to limited knowledge, low self-efficacy, and inadequate follow-up education (Gadager et al., 2022). Nurses are well positioned to address these barriers through structured patient education during hospitalization. Previous studies have shown that nurse-led interventions improve cardiovascular risk management, lifestyle adherence, glycemic outcomes, self-care behaviors, and self-efficacy (Yang et al., 2025; Yuksel et al., 2023; Yu et al., 2022). Likewise, systematic reviews support the effectiveness of diabetes self-management education and support (DSMES), while emerging digital and messaging-based nurse-led approaches have demonstrated additional benefits for patient knowledge and self-management (Adamu et al., 2025; Meekaew et al., 2025).

Despite the growing evidence supporting nurse-led education, important knowledge gaps remain. Most previous studies have evaluated educational interventions for cardiovascular disease or diabetes separately, whereas evidence on integrated nurse-led education specifically designed for hospitalized patients with concurrent acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM) is still limited. Furthermore, few studies have examined such interventions in resource-constrained settings where structured transitional education is not routinely incorporated into inpatient care. In Indonesia, where the burden of diabetes and cardiovascular disease continues to increase, evaluating a practical nurse-led education model is essential to strengthen secondary prevention and improve patients' readiness for long-term self-management after hospital discharge. Therefore, this study aimed to evaluate the effect of a structured nurse-led heart and diabetes management education program on knowledge and self-management among hospitalized patients with acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM).

2. METHOD

The quasi-experimental design without a control group limits internal validity and causal inference. In addition, the single-center setting may reduce the generalizability of the findings. The seven-day follow-up period was sufficient to evaluate immediate educational effects but was unlikely to capture sustained changes in self-management behavior or longer-term clinical outcomes. Future studies should include extended follow-up periods to determine whether the observed improvements are maintained over time and translate into clinically meaningful benefits, such as improved glycemic control, medication adherence, reduced readmissions, and better cardiovascular outcomes. The study was conducted at Dr. M. Djamil General Hospital, Padang, specifically in the Cardiology Outpatient Clinic, Cardiac Ward (inpatient), and CVCU. Data collection took place in October–November 2024, within the overall research period of August–December 2024.

The target population consisted of patients diagnosed with ACS and T2DM receiving treatment at the study hospital. Participants were eligible if they had a confirmed diagnosis of acute coronary syndrome (ACS) (STEMI, NSTEMI, or unstable angina) and type 2 diabetes mellitus (T2DM), were aged between 18 and 65 years, were clinically stable at the time of recruitment, were able to communicate in Indonesian, and were willing to participate as evidenced by signed informed consent. Patients with advanced complications such as severe heart failure, advanced chronic kidney disease, severe pulmonary disease, cognitive impairment, altered consciousness, or hemodynamic instability were excluded.

The minimum required sample size was calculated using the Lemeshow formula for paired comparison as described by Sastroasmoro and Ismael, resulting in a minimum of 32 participants. To increase statistical power and minimize the impact of potential attrition, a total of 50 participants were recruited using consecutive sampling.

Data were collected using two structured questionnaires assessing knowledge and self-management. The knowledge questionnaire measured participants' understanding of acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM) management, including disease concepts, medication adherence, dietary recommendations, physical activity, blood glucose monitoring, and recognition of warning signs. The self-management questionnaire evaluated daily management behaviors such as adherence to medication, dietary regulation, glucose monitoring, physical activity practices, and symptom management.

Both instruments underwent content validation by three independent experts, including a cardiovascular nurse specialist, an internal medicine specialist with expertise in diabetes management, and a nursing academic experienced in educational material development. The experts evaluated the relevance, clarity, clinical accuracy, and contextual appropriateness of each item. Revisions were made based on their recommendations before the questionnaires were finalized and implemented in the study. Blood pressure was measured using a calibrated digital sphygmomanometer following standardized clinical procedures.

The educational module and leaflet were developed by the research team based on current international and national clinical guidelines on acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM) management. The development process included literature review, synthesis of guideline recommendations, drafting of structured educational content, expert review, and revision. Validation focused on content accuracy, clinical relevance, logical sequencing of material, language clarity, and cultural appropriateness. Only materials that met expert agreement were finalized and used in the intervention to ensure scientific rigor and contextual suitability.

The intervention consisted of a structured nurse-led education program delivered individually through face-to-face sessions. As illustrated in Figure 1, the program was conducted in two sessions. The first session (30–45 minutes) focused on foundational knowledge of acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM),

including disease mechanisms, medication adherence, glycemic and blood pressure control, and recognition of warning symptoms. The second session was delivered 24–48 hours later (20–30 minutes) and emphasized clarification, reinforcement, lifestyle modification, and application of the teach-back method to confirm patient understanding.

The total duration of the intervention ranged from 50 to 75 minutes. Core components included medical and symptom management, lifestyle and behavioral modification, and structured confirmation of comprehension. Posttest assessment was conducted seven days after completion of the second session.

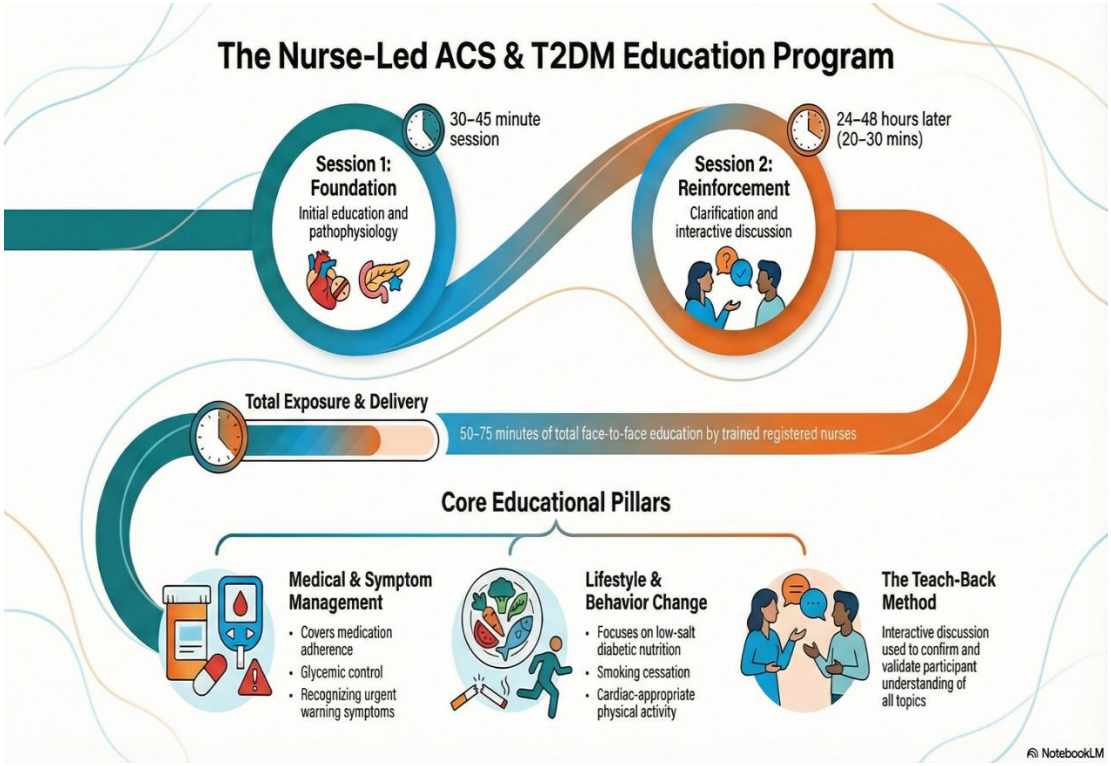

Figure 1. Structured Nurse-Led Education Program for Patients with Acute Coronary Syndrome and Type 2 Diabetes Mellitus.

Posttest measurements were conducted seven days after completion of the second educational session, either during scheduled follow-up visits or reassessment appointments. The same questionnaires were administered to evaluate changes in knowledge and self-management. The seven-day interval was selected to allow participants time to begin applying self-management behaviors while minimizing short-term recall bias.

Data were analyzed using SPSS software. Descriptive statistics were used to summarize participant characteristics and study variables. Normality of data distribution was assessed using the Shapiro–Wilk test. Differences between pretest and posttest scores were analyzed using paired-sample t-tests with a significance level set at $\alpha = 0.05$ and a 95% confidence interval. Effect size was calculated to determine the magnitude of the intervention effect.

Ethical approval was obtained from the institutional ethics committee prior to data collection. Participants received comprehensive information regarding the study objectives, procedures, benefits, and confidentiality assurances. Written informed consent was obtained from all participants. Data were coded to maintain anonymity, and participants were informed of their right to withdraw at any time without affecting their medical care.

3. RESULTS AND DISCUSSION

A total of 50 patients with acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM) were included.

Table 1. Participant Characteristics (n = 50)

Characteristic	Value
Age (years)	54.82 ± 11.22; median 57 (21–73)
Duration of diabetes (years)	3.86 ± 4.31; median 1 (1–16)
Systolic blood pressure (mmHg)	117.74 ± 14.84; median 120 (80–145)
Diastolic blood pressure (mmHg)	72.66 ± 10.21; median 72 (45–94)
Male	33 (66.0%)
Female	17 (34.0%)
Primary education	2 (4.0%)
Secondary education	37 (74.0%)
Tertiary education	11 (22.0%)

Table 1 shows that the mean age was 54.82 ± 11.22 years, and most participants were male (66.0%) with secondary education (74.0%). The mean duration of diabetes was 3.86 ± 4.31 years. Baseline systolic and diastolic blood pressure were 117.74 ± 14.84 mmHg and 72.66 ± 10.21 mmHg, indicating that most patients were clinically stable at the time of intervention. These characteristics reflect a middle-aged cardiometabolic population consistent with previous epidemiological reports.

Table 2. Effect of Nurse-Led Education on Knowledge and Self-Management (Paired t-test, n = 50).

Outcome	Pretest Mean ± SD	Posttest Mean ± SD	Mean Difference	95% CI	t	df	p-value	Cohen's d	η^2
Knowledge	19.96 ± 3.69	22.68 ± 1.70	+2.72	2.02 – 3.42	7.85	49	<0.001	0.94 (large)	0.56 (large)
Self-management	98.38 ± 15.30	100.48 ± 13.32	+2.10	0.79 – 3.41	3.25	49	0.002	0.15 (small)	0.18 (moderate)

Table 2 shows that knowledge scores increased significantly with a large effect size ($d = 0.94$; $\eta^2 = 0.56$), indicating that more than half of the variance in knowledge change was attributable to the intervention. The 95% confidence interval (2.02–3.42) confirms the robustness of this improvement. This finding supports evidence that structured nurse-led education effectively enhances disease-related understanding in patients with acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM), who require integrated cardiometabolic management (Bergmark et al., 2022; Shah et al., 2025; American Diabetes Association Professional Practice Committee, 2025).

Self-management also improved significantly ($p = 0.002$). Although Cohen's d suggested a small effect (0.15), the eta squared value (0.18) indicates a moderate practical contribution of the intervention. The confidence interval (0.79–3.41) suggests consistent positive change. The smaller magnitude compared to knowledge is expected, as behavioral adaptation typically requires sustained reinforcement beyond short-term inpatient education (Bagheri et al., 2022; Kenç & Erkoç, 2024).

Although the improvement in self-management was modest (mean difference = 2.10 points; Cohen's d = 0.15), its clinical relevance should be interpreted within the context of the intervention duration and patient population. The posttest assessment was conducted only seven days after the educational intervention, allowing limited time for participants to translate newly acquired knowledge into sustained self-management behaviors. Behavioral change typically develops gradually and requires continuous reinforcement through follow-up education, coaching, and ongoing support. Therefore, the observed early improvement may represent an important initial step toward long-term behavioral adaptation, particularly among patients recovering from acute coronary syndrome who are simultaneously adjusting to complex diabetes self-

management requirements.

Furthermore, even modest improvements in self-management during the transition from hospital to home may enhance medication adherence, lifestyle modification, symptom monitoring, and patient confidence, all of which are essential components of secondary cardiovascular prevention. Longer follow-up studies are needed to determine whether these early behavioral improvements translate into sustained clinical benefits, including better glycemic control, reduced readmission, and improved cardiovascular outcomes.

These findings are consistent with prior studies demonstrating the effectiveness of nurse-led education in secondary prevention and diabetes self-management (Henriksson et al., 2021; Sakashita et al., 2021; Chen et al., 2025). Evidence from the NAILED-ACS trial and related transitional care models indicates that structured follow-up enhances long-term cardiovascular risk reduction (Henriksson et al., 2021). Digital and telehealth-supported education approaches have also demonstrated improved adherence and discharge readiness (Harlianto et al., 2023; Ellis et al., 2025; Chow et al., 2022; Livori et al., 2023). Therefore, the present findings highlight the value of embedding structured nurse-led education within discharge planning, while suggesting that additional follow-up strategies may strengthen sustained behavioral outcomes.

Despite the positive findings, several limitations should be considered. The quasi-experimental design without a control group limits causal inference. The single-center setting may affect generalizability, and outcomes were measured over a short follow-up period. Future studies using randomized designs and longer-term clinical endpoints such as HbA1c, LDL cholesterol, blood pressure control, and readmission rates are recommended to evaluate sustained cardiometabolic impact (Yuksel et al., 2023).

Overall, the findings suggest that the structured nurse-led heart and diabetes management education program was associated with improved knowledge and modest early improvements in self-management among patients with acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM). The substantial improvement in knowledge indicates that the intervention effectively enhanced patients' understanding of disease management. However, the relatively small effect size for self-management suggests that behavioral change was still at an early stage and should be interpreted cautiously. Because the study employed a quasi-experimental design without a control group and included only a seven-day follow-up period, the observed improvements cannot be attributed solely to the intervention, and the long-term sustainability of behavioral changes and clinical benefits remains uncertain.

Knowledge acquisition generally precedes behavioral change, particularly in patients with complex chronic conditions requiring multiple lifestyle modifications and medication adherence. Therefore, the modest improvement in self-management observed in this study may represent an initial response to the educational intervention rather than a stable behavioral change. Future randomized controlled trials with extended follow-up are needed to determine whether these early improvements are sustained and translate into clinically meaningful outcomes, including improved glycemic control, cardiovascular risk reduction, medication adherence, and lower hospital readmission rates.

The findings of this study support the integration of structured nurse-led education into routine nursing care for patients with acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM). Given the complexity of managing these coexisting conditions, standardized educational interventions should become an integral component of inpatient care and discharge planning to strengthen patients' knowledge and self-management skills.

One important implication is the need to standardize the educational package by providing consistent core messages accompanied by a simple written discharge plan. Standardization would help ensure that educational content is delivered uniformly across nursing shifts and hospital wards, thereby reducing variations in patient

education and promoting continuity of care.

The findings also highlight the importance of extending education beyond hospitalization through structured follow-up, such as telephone calls or telehealth consultations. These follow-up strategies provide opportunities to reinforce self-management skills, identify barriers to adherence, and adjust individualized care plans after discharge. Such an approach is supported by previous evidence demonstrating the effectiveness of nurse-led telephone interventions in improving self-management among patients with type 2 diabetes mellitus (T2DM) and promoting long-term risk factor management following acute coronary syndrome (ACS) (Kenç & Erkoç, 2024; Rao, 2025).

Furthermore, adherence to treatment and secondary prevention should be strengthened through multidisciplinary collaboration that connects patients with ongoing support after hospital discharge. Telehealth-based medication follow-up has been shown to improve adherence to optimal medical therapy among patients with acute coronary syndrome (ACS), while mobile messaging interventions have also demonstrated positive effects on long-term treatment adherence. These findings suggest that structured nursing education should be integrated with sustainable post-discharge support systems to optimize long-term cardiometabolic outcomes (Chow et al., 2022; Livori et al., 2023).

A major strength of this study is its focus on a high-risk patient population with acute coronary syndrome (ACS) and comorbid type 2 diabetes mellitus (T2DM), a group requiring comprehensive cardiometabolic management. In addition, the pretest–posttest design enabled the evaluation of immediate changes in patients' knowledge and self-management following a structured nurse-led educational intervention, providing valuable evidence regarding the short-term effectiveness of this approach.

Nevertheless, several limitations should be considered when interpreting the findings. The quasi-experimental design without a control group limits the ability to establish causal relationships between the intervention and observed outcomes. Moreover, the study was conducted in a single tertiary hospital, which may reduce the generalizability of the findings to other healthcare settings. The reliance on self-reported measures introduces the possibility of response bias, while the relatively short follow-up period only captures early behavioral changes and does not allow assessment of the long-term sustainability of the intervention.

Future research should employ more rigorous study designs, preferably randomized controlled trials with larger and more diverse populations, to strengthen causal inference. Longer follow-up periods are also needed to determine whether the observed improvements in knowledge and self-management are maintained over time and translate into clinically meaningful outcomes, including improved HbA1c, LDL-C, blood pressure control, medication adherence, and reduced hospital readmissions. Previous evidence from nurse-led diabetes self-management programs indicates that clinically meaningful improvements in glycemic control are more likely when educational interventions are sustained over several months, underscoring the need to evaluate extended nurse-led follow-up models for patients with ACS and T2DM (Yuksel et al., 2023).

4. CONCLUSION

This study demonstrated that a structured nurse-led heart and diabetes management education program was associated with significant improvements in disease-related knowledge and modest early improvements in self-management among hospitalized patients with acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM), thereby achieving the study objective. These findings highlight the important role of nurses in equipping patients with the knowledge and self-management skills required to support effective cardiometabolic care following hospital discharge. The findings suggest that integrating structured nurse-led education into

routine inpatient care and discharge planning may strengthen transitional care and facilitate long-term self-management for patients with coexisting ACS and T2DM. To maximize its effectiveness, educational interventions should be complemented by standardized educational materials, multidisciplinary collaboration, and post-discharge follow-up strategies, such as telephone or telehealth support, to reinforce self-management behaviors and treatment adherence. Future research should use randomized controlled trials with larger and more diverse populations, extended follow-up, and objective clinical outcomes, including glycemic control, cardiovascular risk factors, medication adherence, and hospital readmission rates, to determine the long-term effectiveness and sustainability of structured nurse-led education.

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