Med Glas (Zenica) 2025;22(2)
https://doi.org/10.17392/1918-22-02

Med Glas (Zenica)

ORIGINAL ARTICLE

Impact of a modified discharge program on health outcomes after coronary bypass surgery: a randomized trial

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ABSTRACT

Aim To examine the effects of implementing a modified Re-Engineered Discharge (RED) intervention on major adverse cardiovascular and cerebrovascular events (MACCE) and readmission rates 30 days after coronary artery bypass graft (CABG) surgery.

Methods A randomized clinical trial was conducted with 104 patients who underwent elective CABG surgery. Patients were randomly assigned to either an intervention group or a control group. The intervention group received discharge training through the modified RED program, while the control group followed the standard discharge protocol used at the Centre. Data on major adverse events and readmission rates were collected 30 days after discharge.

Results The results indicated no statistically significant differences between the intervention and control groups regarding major adverse events even though the control group experienced death, reopening and readmission rate slightly more than intervention group (2% vs. 0%; p=0.471 and 2% vs. 1%; p=1.000, respectively (x^2=0.273, P=0.603). Both groups showed similar outcome after the implementation of the modified RED.

Conclusion This study contributes to the growing body of research on discharge interventions by providing insights into the challenges of integrating structured programs into routine care. It highlights the importance of comprehensive planning, resource allocation, and extended follow-up to enhance patient outcomes in cardiac surgery.

Keywords: cardiac surgical procedures, patient discharge, patient readmission, re-engineered discharge

INTRODUCTION

Cardiovascular diseases (CVD) are the main threats to human lives . Around 17.9 million deaths worldwide were attributed to CVD, which represents 31% of the global deaths (1). The prevalence of coronary artery disease (CAD) as one of the CVDs, among US adults aged 20 and older is 6.3%. It is responsible for 43.8% of the deaths worldwide (1). According to the Centres for Disease Control and Prevention, Jordan's leading cause of mortality is CVDs with a cause-specific mortality rate of 18.6 (2).

Coronary artery diseases are currently managed with medical treatment, percutaneous coronary interventions (PCI), or coronary artery bypass graft (CABG) surgery (3). The CABG surgery is the indicated choice for multi-vessel coronary disease (3). It is defined as a revascularization procedure used for the treatment of CAD. It involves establishing a graft from another body vessel to bypass the narrowed coronary artery and restore blood flow to the cardiac muscle (4). Among Jordanians who underwent CABG surgery, 90% out of 161 patients had a comorbid chronic disease; more than 34% were diabetic and hypertensive (4). Even though CABG surgery is believed to provide complete revascularization and to lead to improved long term outcomes than PCI, the recovery process after hospital discharge might be complicated by the occurrence of major adverse cardiovascular and cerebrovascular events (MACCE) (5). The MACCE consist of mortality, myocardial infarction (MI), stroke and need for repeat revascularization (5).

Myocardial infarction after CABG surgery is a Type 5 MI (6). Reportedly, out of 2,215 CABG patients, 5.8% developed acute MI post-surgery, while 3.8% required repeat revascularization (7). Repeat revascularization is a new CABG or PCI procedure that needs to be done due to documented ischemia or graft failure, and it is one of the MACCE that might occur within 30 days after CABG surgery (7). The prevalence rate of repeated revascularization among CABG patient ranges from 0.5% -1.3%. Stroke is an acute focal neurological deficit lasting ≥ 24 hours with or without confirmatory imaging (8).

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| Submitted: 28. Oct. 2024. Revised: 15 Mar. 2025. Accepted: 16 Mar. 2025.

Around 1.3% of CABG patients developed stroke after the surgery, which causes a near 20% mortality rate perioperatively (8). Among the Jordanian population, CABG patients who had a stroke made 2.3% of the sample (1046 patients); of these, 33.3% died (9).

Reducing mortality and hospital readmission following cardiac surgery has become a national priority in the US and worldwide (8).Unclear discharge instructions and lack of follow-up plans are among the reported reasons for hospital readmissions. Patient experience with discharge instructions shows that patients discharged with sufficient information and provided follow-up care were better at managing postoperative problems and experienced improved post-discharge outcomes (8). Nurses play a significant role in providing multidimensional interventions to facilitate the patient's transition after the surgery, decrease complications, and subsequently reduce their readmission (10). Examples of these interventions include discharge planning, discharge education, home visits, rehabilitation programs, telephone follow-up calls, telehealth, and discharges to short-term skilled nursing facilities, reducing readmission rates (11). These nursing delivered interventions' primary intended outcome is to reduce mortality, hospital readmission, and improve patient outcomes among CABG patients (12). In Jordan, a study found that open-heart patients who did not receive pre-surgery health instructions demonstrated a higher need for post-surgery self-care instructions. The researchers recommended better utilization of the nurses working with CABG patients to provide adequate and appropriate education before hospital discharge (12).

The aim of this study was to investigate the effect of implementing a modified discharge program (project-RED intervention) on major adverse cardiovascular and cerebrovascular events, readmission rate, and health-related quality of life among CABG patients 30 days after surgery.

PATIENTS AND METHODS

Patients and study design

Post-test only (after-only) Randomized Controlled Trial (RCT) design was used to examine the effect of a modified Project-RED intervention on MACCE, and readmission rate 30 days after CABG surgery among Jordanian patients. The Randomized Controlled Trial (RCT) design was chosen for its ability to establish cause-and-effect relationships by manipulating an independent variable through intervention, ensuring randomization and control to eliminate bias in participant allocation, and guaranteeing the validity of statistical tests through randomization.

The study was conducted at Queen Alia Heart Institute, the largest specialized centre in cardiovascular surgeries in Jordan with a capacity of 215 beds. The study's participants were patients who had undergone CABG surgery prior to their discharge from the hospital. The inclusion criteria were: patients who had undergone first-time isolated elective CABG surgery for single, double, or triple CAD; speaking Arabic; agreeing to participate in the study; being free from any psychological problems; having a contact telephone number; not having had aortic calcification or a stroke; and aged over 21 years. The exclusion criteria included patients diagnosed with mental disorders, who may be at risk of not adhering to postoperative discharge education and follow-up instructions. Patients who died during their index hospitalization before having been discharged from hospital were considered at risk of stroke. If the patient's current medical diagnosis included cerebrovascular disease, transient ischemic attack (TIA), and/or carotid stenosis ≥70%, these conditions were considered to be risk factors for stroke, which is one of the MACCE. For whatever reason, the patients underwent an emergency CABG after the PCI procedure, which increased the susceptibility to MACCE. The postoperative hospital stay was longer than usual, lasting over 15 days, because of surgical complications, which also increased the risks of MACCE and readmission.

Methods

The calculation of the sample size was designed to ensure sufficient statistical power to detect differences between the groups. A power analysis was conducted before starting the study to determine the required sample size, thereby reducing the likelihood of type II errors. This analysis considered several key factors: the significance level (alpha; α), where a higher alpha reduces power; the sample size, with larger samples typically increasing power; the effect size, which reflects the strength of the relationship between variables; and the power itself, which is the probability of correctly identifying true relationships or differences between groups while avoiding false null hypotheses. Researchers usually set α=0.05 to minimize the risk of type I errors and target a power of 0.80. Effect sizes are often estimated based on existing evidence, frequently from pilot studies or prior research in similar fields. In nursing research, medium effect sizes are typically expected. For this study, the sample size estimation used the $\chi 2$ test and G*Power software. With a significance level of 0.05, a medium effect size of 0.50, and a desired power of 0.80, the calculations suggested that 52 patients per group were needed, in total 104. To account for a 30% dropout rate, the study aimed to recruit 67 patients per group, or 134 in total, to ensure that 52 patients per group completed the study (Figure 1). Single-centre non-probability sampling was used to select the study participants. The sampling procedure adopted the block randomization method in order to select at least 118 patients. Blocked randomization could provide approximately equal groups of participants assigned to intervention and control groups. Block of 2,4 or 6 was used each day to assign the pa-

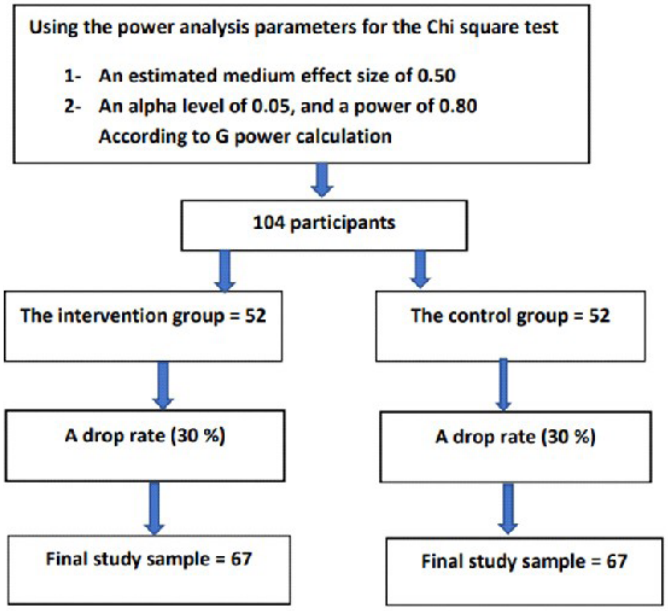

Figure 1. Sample size calculation

tients to intervention and control groups. The SPSS random number generator used to assign a random number to each patient. Each day, one-half of the CABG patients were assigned to the intervention group and the other half to the control group. The order in which the intervention was assigned in each block was randomized, and this process was repeated for all consecutive blocks of participants.

Ethical approval was obtained from the University and Hospital Research Ethics Committee (No 918/5/2). The patients were provided with information regarding the study's objectives and were assured that participation was optional allowing them to withdraw at any point. Before conducting the study, oral and written consents from the patients were obtained. On ClinicalTrials.gov, the study's registration number was NCT04527822.

Based on literature review, data were collected by instruments constructed by the researcher: major adverse cardiovascular and cerebrovascular events data collection sheet, the readmission data collection sheet, demographic, disease history and operation conduct questionnaire (13).

After obtaining Institutional Review Board (IRB) approval from the Jordanian Royal Medical Services, the researcher informed cardiac surgeons and head nurses about the study. On the third day post-surgery, patients were assessed for inclusion. Those meeting the criteria and agreeing to participate signed informed consent forms, and baseline data were collected. Participants were then randomly assigned to intervention or control groups. The control group received routine discharge care from the hospital. The routine discharge care at hospital included a written single page discharge summary handed to the patient, a box of medications sufficient for 30 days, an appointment for the cardiac surgery clinic (booked to be two weeks after discharge), and a verbal education on how the patient should take medications. The education might include verbal advice on smoking cessation, walking exercise, change of diet. The education might vary among different health care providers as there is no standardized protocol. On the other hand, for patients in the intervention group, the researcher began preparing the After-Hospital Care Plan (AHCP). The preparation of the AHCP as an educational document was done through 3 main steps: 1- review of the patient medical record in the unit through HAKEEM; 2- conducting a meeting with the medical team, 3- meeting with the patient. On the day of discharge, patients received the AHCP, which included educational material, a re-conciliated medication list, and booked (scheduled) -up appointments with the cardiac surgery clinic. The education was done using the teach-back method. Conversely, the intervention group received a telephone call for follow-up in the first three days after discharge. The researcher checked with them any emerging signs and symptoms, their self-care issues, and medications. Finally, at 30 days after discharge, the intervention and control groups were contacted by telephone for follow up and to check if they were admitted in any hospital and if they had any of the MACCEs. Patients' medical records were checked for any readmissions and the occurrence of the MACCE and verification of data (Figure 2).

The study was conducted between 15 July 2020 and 30 October 2020 because of the closure of cardiac surgery clinics and the postponement of all the elective cardiac surgeries in the Centre due to the COVID-19 pandemic in Jordan.

The study intervention was a nurse-led discharge planning program. The program was based on selected Project-RED components illustrated in the Project-RED toolkit (14,15). The Agency for Healthcare Research and Quality (AHRQ) was in coordination with the Boston Medical Center, and developed six modules to help hospitals launch and implement project-RED within their institutions. The nurse-led discharge planning program was implemented by a nurse called discharge educator (DE). The DE responsibility was to prepare patients for going home. The DE collaborated with the patients' multidisciplinary teams about what happened during the hospital stay and what needed to be done for a safe transition home. The DE was responsible for creating the AHCP, an easy-to-understand discharge plan, and taught it in a way that enabled patients to understand how to care for themselves once they went home. Due to some limitations experienced in relation to availability of discharge educators in the Center, the researcher in the current study was the DE, and she was the one who prepared the AHCP and conducted the telephone follow-up call. However, she was in direct contact and collaboration with a pharmacist from hospital and a cardiac surgeon if any consultation was needed for the patients' safety. Moreover, due to lack of Information Technology (IT) support and the technical assistance, the researcher was unable to transfer the discharge summaries to clinic providers.

Statistical analysis

Descriptive statistics, including the frequency distribution and percentages, were used to analyse nominal data as well as demographic data and the participants' clinical variables. Inferential analysis was used to examine the differences between

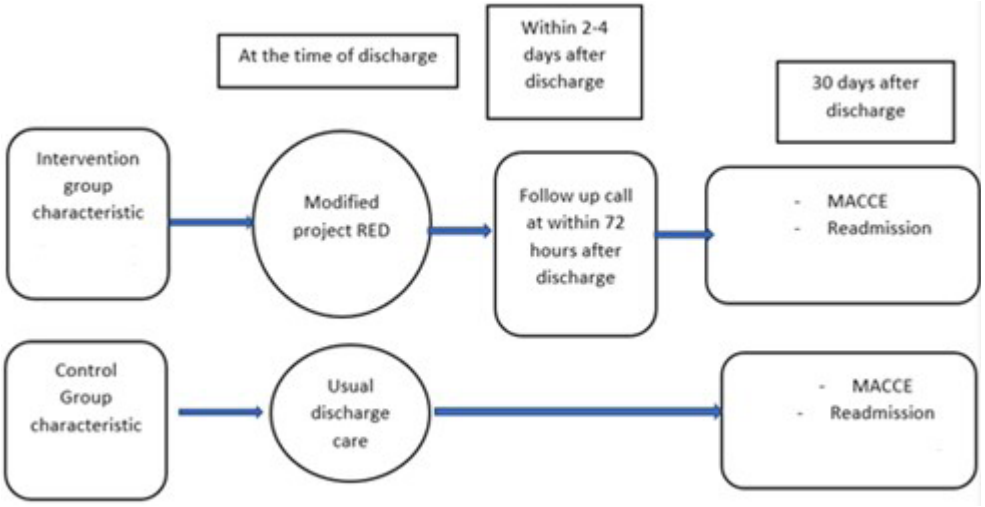

Figure 2. Data collection procedure

the groups on a range of variables. An independent t-test and $\chi 2$ test were used to compare the demographic data and clinical variables between both groups and assess group differences in the study dependent variables (occurrence of the MACCE, readmission**).** Alternative tests like Wilcoxon Mann-Whitney, and Fisher exact test were used when needed.

RESULTS

One hundred and eighteen patients met the study inclusion criteria. The 118 patients agreed to participate and signed the consent form. The patients were assigned randomly to either the intervention or control group using block randomization, 59 in the intervention group and 59 in the control group. Four patients from the intervention group did not complete the study. Two of them did not answer the follow-up call within the first (2-4) days post-discharge, and two did not answer the researcher's call at 30 days post-discharge. Therefore, the final sample in the intervention group consisted of 55 patients. Patients in the intervention group received the modified project-RED intervention with a written discharge plan before discharge from the hospital. MACCE and the readmissions were checked 30 days post-discharge through a phone call with the patient and their caregivers and confirmed through the electronic medical records. On the other hand, ten participants from the control group did not complete the study because they did not answer the researcher's call 30 days post-discharge because of an invalid or disconnected mobile number. Therefore, the sample of the control group consisted of 49 patients. Patients in the control group received the standard discharge care in the centre, and all of them were called 30 days post-discharge to assess the study outcomes as in the intervention group.

One hundred and four participants (55 intervention and 49 control) completed the study. The participants' age ranged between 40-77 (mean of 56.62; SD=8.455) years. The sample consisted of 86 (82.7 %) males. Most patients were married, 95 (91.3 %), the majority had intermediate education, 48 (46.2 %), 65 (62.5 %) were unemployed or retired. Concerning the clinical variables, 53 (51%) patients had dyslipidaemia, 54 (51.9%) had diabetes, and 52 (50%) had hypertension. The majority of participants did not experience CVA before, 100 (96.2 %), and all of them had a previous history of MI; 45 (43.3%) underwent three grafts surgery.

A comparison between the intervention group and the control group was conducted to assess the sample characteristics' homogeneity. An independent sample t-test was used to compare age, pre-operative creatinine level, post-operative creatinine level, aortic cross-clamp time, ICU length of stay, hospital length of stay, and period mechanical ventilation. A preliminary data screening showed that these variables were approximately normally distributed, except for the period of mechanical ventilation variable. Leven's test was conducted to assess the homogeneity of variance assumption, and the homogeneity of variance was met for the mentioned variables except for mechanical ventilation.

The t-test showed no significant differences in the participants' mean age in the intervention group (M= 56.98, SD=8.06) and the control group (M=56.2, SD=8.937). Besides, there were no significant differences between the two groups related to the following clinical variable: pre-operative creatinine level (P=0412), post-operative (P=0.807) creatinine level, aortic cross-clamp time (P=0.500), Intensive Care Unit (ICU) length of stay (P=0.628), and hospital length of stay (P=0.336). For the period of mechanical ventilation, the Mann-Whitney test was employed. The demographic and clinical characteristics of the intervention and control groups were similar across various variables. Gender distribution showed that 83.6% of the intervention group and 81.6% of the control group were male, with no significant difference (P=0.787). Education levels were also comparable, with 45.5% and 46.9% of the intervention and control groups, respectively, having intermediate education, and no significant difference observed (P=0.967). In terms of social status, 87.3% of the intervention group and 95.9% of the control group were married, with no significant difference (P=0.167). Employment status, dyslipidaemia, diabetes, and hypertension were similarly distributed between the groups, with no significant differences (P-values ranged from 0.844 to 0.879). Ejection fraction data showed a higher percentage of normal ejection fraction in the control group (61.2%) compared to the intervention group (45.5%) (P=0.108). Previous stroke history was rare in both groups, with 1.8% of the intervention group and 6.1% of the control group reporting prior strokes (P=0.341). The number of post-operative blood transfusion units and grafts were comparable between the groups, with no statistically significant differences observed (Fisher's exact test: $\chi^2 = 2.281$, $P = 0.905$; $\chi^2 = 3.172$, $P = 0.579$, respectively). These findings indicate that the intervention and control groups were largely comparable across most demographic and clinical characteristics. The results of the Wilcoxon Mann-Whitney test indicated a statistically significant difference between the intervention group and the control group participants ($Z = -2.306$; P=0.021) (Table 1).

To compare the differences between the two groups regarding the categorical variables (gender, social status, employment, education, dyslipidaemia, diabetes mellitus, hypertension, previous stroke, ejection fraction, myocardial infarction, number of grafts, number of blood units received during or post-surgery), $\chi 2$ test was used. The data were checked for the assumptions of the $\chi 2$ test, and all assumptions were met for the following variables: gender, education, employment status, dyslipidaemia, diabetes mellitus, hypertension, and ejection fraction. Categories of the variables were mutually exclusive, the two groups were independent, and all variables were categorical; additionally, the expected cell frequencies were ≥5. For the following variables (social status, number of previous strokes, number of grafts, and number of blood unit received intra, or post-operatively $\chi 2$ assumption was violated as the expected cell frequencies were <5. Alternatively, Fisher exact test was employed to compare between the intervention and the control group concerning social status, number of previous strokes, number of grafts, and number of blood units received intra or post-operatively. The results of $\chi 2$ test and Fisher exact tests showed that there were no significant differences between the intervention and control groups in all categorical variables. Moreover, all patients in both groups underwent pump CABG (Table 1).

The $\chi 2$ test was performed to compare between the intervention and control groups regarding the occurrence of MACCE. The $\chi 2$ assumption of the number of the expected count in each cell was not met. Four cells (66.7 %) had an expected count of <5. Accordingly, Fisher's exact test was employed. The results were not statistically significant. This means that the patients in the intervention group did not differ significantly in the percentage of the MACCE from the control group. In addition**,** $\chi 2$ test was used to assess the association between the intervention and the patient's readmissions within 30 days post-discharge.

Table 1. Comparison of patient's characteristics according to group (N=104)

Variable	Intervention group	Control group	P
	M (SD)	M (SD)	
Age (years)	56.98 (8.066)	56.2 (8.937)	0.642
Pre-operative creatinine 0.7-1.3 mg/dL (61.9 to 114.9 µmol/L) for mails and 0.6 to 1.1 mg/dL (53 to 97.2 µmol/L) for females (mg/dL)	0.8502 (.2823)	0.8918 (.2264)	0.412
Post-operative creatinine 0.7 to 1.3 mg/dL (61.9 to 114.9 µmol/L) for mails and 0.6 to 1.1 mg/dL (53 to 97.2 µmol/L) for females (mg/dL)	0.8253 (0.26316)	0.8369 (0.221614)	0.807
Aortic cross-clamp time (minutes)	56.69 (18.885)	54.39 (15.334)	0.500
ICU length of stay (days)	2.13 (1.292)	2.24 (1.164)	0.628
Hospital length of stay (days)	7.67 (2.381)	8.14 (2.574)	0.336
Period of mechanical ventilation	Z=-2.306*		0.021
	No (%) of patients		
Gender			0.787
Male	46 (83.6)	40 (81.6)	
Female	9 (16.4)	9 (18.4)	
Education			0.967
Intermediate	25 (45.5)	23 (46.9)	
Secondary	17 (30.9)	14 (28.6)	
Collage/university	13 (23.6)	12 (24.5)	
Social status			0.167
Married	48 (87.3)	47 (95.9)	
Widow	7 (12.7)	2 (4.1)	
Employment status			0.879
Employed	21 (38.2)	18 (38.7)	
Not employed/retired	34 (61.8)	31 (63.3)	
Dislipidemia			0.991
Yes	28 (50.9)	25 (51.0)	
No	27 (49.1)	24 (49.0)	
Diabetes			0.862
Yes	29 (52.7)	25 (51.0)	
No	26 (47.3)	24 (49.0)	
Hypertension			0.844
Yes	27 (49.1)	25 (51)	
No	28 (50.9)	24 (49)	
Ejection fraction			0.108
Normal	25 (45.5)	30 (61.2)	
Abnormal	30 (54.5)	19 (38.8)	
Experienced previous strokes			0.341
Yes	1 (1.8)	3 (6.1)	
No	54 (98.2)	46 (93.9)	
Units of blood received post-operatively	χ^2 =2.281†		0.905
0	23 (41.8)	20 (40.8)	
1	23 (41.8)	18 (36.7)	
2	4 (7.3)	6 (12.2)	
3	3 (5.5)	4 (8.2)	
4	1 (1.8)	0 (0)	
5	1 (1.8)	1 (2.0)	
Number of grafts	χ^2=3.172†		0.579
1	1 (1.8)	0 (0)	
2	7 (12.7)	8 (16.3)	
3	22 (40.0)	23 (46.9)	
4	25 (45.5)	17 (34.7)	
5	0 (0)	1 (2.0)	

*Mann-Whitney U test; †Fisher exact test
M, Mean; SD, Standard Deviation

All $\chi 2$ test assumptions were met; thus, Pearson $\chi 2$ test was reported. The results were not statistically significant (χ^2=0.273; P=0 .603). Participants in the intervention group did not differ significantly in the readmission rate from the control group. Causes for readmission among the intervention group participants included congested lungs, surgical site infections. Moreover, some patients were readmitted due to pleural effusion associated with decreased air entry that required chest tube insertion. Causes of readmission among the control group patients included surgical site infection associated with a large amount of pus that required washing and vac insertion intraoperatively, congested lungs with lower limb edema and basal

lung crepitations, and pleural effusion (Table 2).

Table 2. Comparison between the intervention and control groups based on the readmission rate (N=104)

Readmission	No (%) of patients in the group		$\chi 2$	P*
	Intervention (N=55)	Control (N=49)		
YES	5 (9.1)	6 (12.2)	0.273	0.602
NO	50 (90.9)	43 (87.8)		

*P, significant at α= 0.05

DISCUSSION

Few studies have been conducted in Jordan among CABG patients (16). However, to the best of the researcher's knowledge, none of them studied the effect of discharge planning interven tion on the occurrence of MACCE or readmission rate. The demographics and clinical variables of patients in the current study were consistent with prior research conducted in similar population (16). Similarly, Mosleh, Eshah (12) study identified and prioritized the perceived learning needs of Jordanian patients who underwent open-heart surgery or percutaneous coronary intervention. These similarities suggest that the current study's sample was representative of the broader CABG population in Jordan. Despite these consistencies, the discharge planning intervention in the current study did not yield significant improvements in reducing MACCE or readmission rates. This lack of significant results may be attributed to several factors, including the study's design, sample characteristics, and implementation limitations (13). First, the study's stringent inclusion and exclusion criteria may have limited the generalizability of the findings. Participants were restricted to elective CABG patients without high-risk conditions such as acute renal impairment, pneumonia, prolonged inotropic support, or prolonged mechanical ventilation (18). These criteria excluded patients who are typically at higher risk for adverse outcomes, such as those with advanced age (>65 years), left ventricular dysfunction, or critical pre-operative states (17). As a result, the study population was inherently at lower risk for MACCE and readmission, which may have diminished the potential impact of the intervention. For example, the readmission rate in the current study was 4.8% in the intervention group and 5.8% in the control group, significantly lower than the 12.2% reported in a large-scale U.S. studies (18). This suggests that the intervention may have had limited room to demonstrate effectiveness in a low-risk population.

Second, the intervention's design and implementation may not have been sufficiently robust to produce measurable effects. While discharge education is widely recognized as vital for post-operative outcomes, its impact on major adverse events may be limited, particularly in low-risk populations. The current study's intervention was standardized and delivered solely by the researcher, which may have restricted its ability to address individual patient needs. According to effective discharge, education should be individualized, utilize various media, and be delivered over multiple sessions. In contrast, the current study's intervention was delivered in a single session, with limited follow-up (days 2-4 post-discharge), potentially reducing its effectiveness.

Additionally, the study's implementation was limited by its short duration (four months) and reliance on a single researcher for all aspects of the intervention, including recruitment, education, and follow-up. This contrasts with successful implementations of discharge planning programs, such as the RED (Re-Engineered Discharge) project, which emphasize the importance of a dedicated interdisciplinary team, management support, and IT resources as reported by Mitchell, Martin (19). The lack of institutional support and interdisciplinary collaboration in the current study may have further constrained the intervention's effectiveness. Third, the study's theoretical framework, Meleis's Transition Theory (20), was not fully operationalized. The theory emphasizes three key measures of nursing therapeutics: assessing patient readiness for discharge, preparing for the transition, and role supplementation. However, the current study only addressed the second measure (preparation for discharge) and did not assess patient readiness or provide role supplementation. This incomplete application of the theoretical framework may have limited the intervention's ability to facilitate successful transitions and achieve the desired outcomes of mastery and fluid integrative identity. For example, assessing patient readiness for discharge requires an interdisciplinary effort and a comprehensive understanding of each patient's transition conditions, which was not feasible in this study due to resource constraints. Finally, the study's reliance on a relatively small sample size and self-reported outcomes may have introduced bias and limited the statistical power to detect significant differences. While the study aimed to control for confounding factors, external influences such as concurrent events or environmental stressors could not be entirely ruled out. Future studies should consider larger sample sizes, longer intervention periods, and more comprehensive assessments of patient readiness and individualized needs to better evaluate the impact of discharge planning interventions.

However, there were no significant differences between the intervention and control groups; the results of the current study could have implications as the following: in clinical practice, implementing a discharge planning program needs enough resources, assertive and supportive leadership, a highly organized, empowered and well communicated multidisciplinary team, and a hospital build-in technical support system. The discharge planning program is a complicated process, and it needs institutional assets and unlimited commitment. Our patients will not benefit from small, individualized efforts and the very limited resources. Furthermore, the knowledge obtained from the current study may enhance future nursing education. Emphasizing the concept of discharge planning and how it should be implemented, and the resources it requires to be successful is an essential aspect in nursing education, whether the education was in the faculties or in-service education in the institutions. The nurses must understand not to underestimate the difficulties associated with the re-engineered discharge planning project implementation (19). In terms of health policy, top management involvement is crucial for re-engineering the discharge process, emphasizing teamwork and commitment. From a research perspective, future studies should consider longitudinal designs, larger and more diverse samples, and explore the impact of discharge planning on different patient populations and outcomes like uncertainty and anxiety (20).

In conclusion, while the current study did not demonstrate significant effects of the discharge planning intervention on MACCE or readmission rates, the findings highlight important considerations for future research. The study's limitations, including its stringent inclusion criteria, standardized intervention design, incomplete application of the theoretical framework, and resource constraints likely contributed to the lack of significant

results. Addressing these limitations in future studies could provide deeper insights into the potential effectiveness of discharge planning interventions and inform more tailored and impactful strategies for improving post-CABG outcome.

ACKNOWLEDGEMENT

The researcher would like to thank all patients who participated in the study as well as all the staff in Queen Alia Heart Institute who facilitated the implementation of the study.

FUNDING

No specific funding was received for this study.

TRANSPARENCY DECLARATION:

Conflict of interests: None to declare.

REFERENCES

1. World Health Organization (WHO). Cardiovascular diseases 2022 https://www.who.int/health-topics/cardiovascular-diseases#tab=tab_1 (accessed: June 26, 2024)
2. Center for Disease Control (CDC) in Jordan: CDC Archive; 2023 [updated 2022. https://archive.cdc.gov/#/details?url=https://www.cdc.gov/globalhealth/countries/jordan/default.htm (accessed: June 26, 2024).
3. Sawalha K, Asad R, Habash F, López-Candales A. Profiling Cardiometabolic Health in Jordan: A Call to Action to Improve Cardiovascular Health. Cureus 2023; 15(5).
4. Althukair WT, Nuhmani S. Effect of different coronary artery revascularization procedures on cognition: A systematic review. Heliyon 2023; 9:9.
5. Oravec N, Arora RC, Bjorklund B, Gregora A, Monnin C, Dave MG, et al. Patient and caregiver preferences and prioritized outcomes for cardiac surgery: a scoping review and consultation workshop. J Thorac Cardiovasc Surg 2023; 166(2):598-609. e7.
6. Thygesen K, Alpert JS, Jaffe AS, Chaitman BR, Bax JJ, Morrow DA, et al. Executive group on behalf of the joint European society of cardiology (ESC)/American college of cardiology (ACC)/American heart association (AHA)/World heart federation (WHF) task force for the universal definition of myocardial infarction. Fourth universal definition of myocardial infarction (2018). Circulation 2018; 138(20):e618-e51.
7. Mizuno Y, Niwa M, Goto SN, Umemoto T; ALICE (All-Literature Investigation of Cardiovascular Evidence) Group. A meta-analysis of randomized trials for repeat revascularization following off-pump versus on-pump coronary artery bypass grafting. Interact Cardiovasc Thorac Surg 2013, 17.5: 878-80.
8. Gaudino M, Angiolillo DJ, Di Franco A, Capodanno D, Bakaeen F, Farkouh ME, et al. Stroke after coronary artery bypass grafting and percutaneous coronary intervention: incidence, pathogenesis, and outcomes. J Am Heart Assoc 2019; 8(13):e013032.
9. AlWaqfi N, Khader Y, Ibrahim K. Coronary artery bypass: predictors of 30-day operative mortality in Jordanians. Asian Cardiovasc Thorac Ann 2012; 20(3):245-51.
10. Kadda O, Marvaki C, Panagiotakos D. The role of nursing education after a cardiac event. Health Science Journal 2012; 6(4):634.
11. Lazar HL. Reducing readmission risk following CABG surgery-Doing whatever it takes. J Card Surg 2018; 33(4):170-1.
12. Mosleh S, Eshah N, Darawad M. Percutaneous coronary intervention and heart surgery learning needs of patients in Jordan. Int Nurs Rev 2016;63(4):562-71.
13. Brown KR, Hawn MT. Operative Techniques in Vascular Surgery. United States: Lippincott Williams & Wilkins; 2023.
14. AHRQ AoHRaQ. Project Red (Re-Engineered Discharge). https://www.ahrq.gov/patient-safety/settings/hospital/red/toolkit/index.html.2010 (accessed: June 09, 2019).
15. Jack BW, Chetty VK, Anthony D, Greenwald JL, Sanchez GM, Johnson AE, et al. A reengineered hospital discharge program to decrease rehospitalization: a randomized trial. Ann of Intern Med 2009; 150(3):178-87.
16. Mosleh SM, Eshah NF, Almalik MM. Perceived learning needs according to patients who have undergone major coronary interventions and their nurses. J Clin Nurs 2017; 26(3-4):418-26.
17. D'Errigo P, Biancari F, Maraschini A, Rosato S, Badoni G, Seccareccia F. Thirty-Day Mortality After Coronary Artery Bypass Surgery in Patients Aged< 50 Years: Results of a Multicenter Study and Meta-Analysis of the Literature. J Card Surg 2013; 28(3):207-11.
18. Laakso A, Hernesniemi J, Yonekawa Y, Tsukahara T. (Eds.). Surgical management of cerebrovascular disease. (Acta Neurochirurgica Supplement Book 107). Germany: Springer Wien New York, 2010.
19. Mitchell SE, Martin J, Holmes S, van Deusen Lukas C, Cancino R, Paasche-Orlow M, et al. How hospitals re-engineer their discharge processes to reduce readmissions. Journal for healthcare quality: J Healthc Qual2016; 38(2):116.
20. Li E, Yuan Y, Li Y, Sun Y, Sun S. Meleis' Transition Theory and its Application. 2024. http://dx.doi.org/10.2139/ssrn.4964696 (accessed: June 2, 2024).