Original Article
2025, 15(4): 55-66
DOI: 10.22038/ebcj.2025.87319.3119

Received: 21/04/2025
Accept & ePublished: 17/12/2025

Evidence Based Care Journal
http://ebcj.mums.ac.ir
Online ISSN: 2008-370X

Impact of Transitional Care Pathway on Treatment Adherence in Acute Coronary Syndrome: A Randomized Controlled Trial

Amirreza Jasmshidbeigi [1], Seyed Reza Mazloom [2], Ali Eshraghi [3], Nayyereh Davoudi [4]*

Abstract

Background: Acute Coronary Syndrome (ACS) is a major global cause of morbidity and mortality, requiring consistent treatment adherence. However, maintaining adherence to diet, physical activity, and medication is challenging. The Transitional Care Pathway (TCP) is a structured intervention that provides personalized education, follow-up calls, and lifestyle planning to support patients during the critical post-discharge period.

Aim: This study was conducted with aim to evaluate the effectiveness of TCP in improving treatment adherence among ACS patients.

Method: In this randomized controlled trial at Imam Reza Hospital, Mashhad, Iran, 79 patients were randomly assigned to the intervention group (n=39; TCP-based education and follow-up) or the control group (n=40; standard oral instructions and pamphlets) using time-block randomization. The allocation sequence, generated via Randomizer.org, was concealed in eight opaque envelopes, opened weekly. Adherence was assessed using Ziaei's Treatment Adherence Questionnaire at baseline and one-month post-discharge.

Results: In the intervention group, the mean age of patients was 57.43 ± 14.31 years, while in the control group, it was 57.48 ± 12.19 years. Pre-intervention mean adherence scores were 49.56 ± 14.24 (intervention) and 49.63 ± 12.75 (control) (p=0.984). Post-intervention scores increased to 66.97 ± 10.78 and 60.03 ± 12.16, respectively (p=0.009). Both groups showed significant within-group improvements (p<0.001), particularly in dietary (p=0.012) and physical activity adherence (p=0.012), while medication adherence showed no significant between-group difference (p=0.308).

Implications for Practice: Integrating TCP into routine care may enhance adherence to non-pharmacologic regimens and improve long-term outcomes in ACS patients. Given the short one-month follow-up, longer-term studies are recommended.

Keywords: Acute Coronary Syndrome, Lifestyle Modification, Patient Education, Transitional Care, Treatment Adherence

1. Student Research Committee, Faculty of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran
2. Department of Medical-Surgical Nursing, School of Nursing and Midwifery, Nursing and Midwifery Care Research Center, Mashhad University of Medical Sciences, Mashhad, Iran
3. Department of Cardiology, School of Medicine, Imam Reza Hospital, Mashhad University of Medical Sciences, Mashhad, Iran
4. Department of Medical-Surgical Nursing, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran

* Corresponding Author Email: davoudin@mums.ac.ir

Introduction

Acute Coronary Syndrome (ACS) is the leading cause of death globally and in Iran, with 19 million deaths in 2021, expected to rise to 23.6 million by 2030 (1, 2). In Iran, ACS has the highest burden in the region and are the leading cause of death (3, 4). The direct treatment costs of coronary artery disease constitute 0.83% of Iran's GDP and 12.18% of total health expenditures, making it a costly issue for the healthcare system (5). Lack of proper risk factor management, including smoking, inactivity, and poor diet, exacerbates the problem (6). Studies have indicated that many heart patients face a heightened risk of mortality or complications due to the recurrence of cardiac events within the first six months following disease onset (7). About thirty percent of deaths after a heart attack occur during the first thirty days; non-treatment adherence is one of the most important factors influencing this. By means of preventative activities including physical activity, a balanced diet, and continuous pharmaceutical usage, one can considerably reduce this risk (8, 9). Researchers believe that many of the risk factors for cardiovascular diseases are related to the awareness and behavior of the patient. Through means of lifestyle modification, educational programs can help to reduce risk-related behaviors and promote better practices (10). Treatment adherence and exhibit the value of the treatment seem to be affected by a coherent care program (11).

Treatment adherence encompasses adherence to medication regimens, dietary modifications, physical activity, and symptom monitoring (12). Several studies have been conducted to enhance treatment adherence in these patients. Most of these studies have been based on a single-time-point educational approach, while fewer studies have focused on a continuous and ongoing interventional approach (11, 13, 14). The safe transition of patients with ACS between cares is crucial since these patients require multiple types of treatment. This is so because gaps in continuity of treatment could produce difficulties like non-adherence to drug regimens, non-following up on needed testing, and increased risk of readmission (15). The initiatives of the healthcare system to reduce the length of hospital stays mean that there is usually not enough time during hospitalization to provide education, plan, and obtain a complete knowledge of the physical and social status of the patient (16). The patient could thus not be able to take care of herself after discharge. During the post-discharge period, patients are delicate and require extra care; consequently, continuity of treatment is rather important (17).

The concept of transitional care pathway (TCP) was introduced in the 1980s, initially focusing on post-discharge home follow-up services, coordinated with discharge plans during the patient's hospital stay (11, 18, 19). Transitional care encompasses a range of supportive programs, follow-up activities, and interventions extending from pre-discharge through post-discharge beyond the hospitalization period (19, 20). The importance of implementing a structured care plan to enhance treatment adherence and demonstrate its effectiveness has been emphasized in several studies (11, 21). A meta-analysis by Verhaegh et al. demonstrated that transitional care interventions significantly reduce mid- and long-term rehospitalization rates in chronic patients, with factors such as follow-up visits, home visits within the first three days post-discharge, and nurse-led care coordination playing a key role in lowering short-term readmission rates (20). One practical approach to providing transitional care post-discharge involves utilizing technology, information, and communication systems. This allows healthcare providers to remain informed about the patient's recovery, manage potential side effects, and address patients' and caregivers' questions and concerns (22). Studies have shown that cardiac surgery patients often forget or fail to fully understand the educational content delivered during hospitalization, creating a gap in post-discharge care. The lack of coordinated, continuous educational programs highlights the necessity of a structured and consistent care plan, underscoring TCP's value (23). Continuous care is crucial; however, both practical experience and research reveal a deficiency in structured transitional care in Iran, resulting in notable gaps in patient management. Patients with ACS frequently encounter disrupted care transitions between hospital units, leading to fragmented, redundant, or insufficient education and interventions. Certain patients are given redundant and superfluous instructions, whereas others overlook critical components of their care plan. Upon discharge, these patients often lack structured follow-up, resulting in decreased adherence to treatment plans, heightened complications, and increased rates of hospital readmissions. The lack of a comprehensive transitional care model underscores the necessity for a structured, patient-centered care pathway that guarantees continuity from hospital admission to post-discharge follow-up.

Although previous studies have addressed aspects of treatment adherence and transitional care in ACS patients, most have been short-term, fragmented, or lacked continuity. There is still no structured,

long-term transitional care model tailored to the Iranian healthcare context. This study aims to fill this gap by designing and evaluating a comprehensive transitional care program to improve adherence and ensure continuity of care in ACS patients. According to a review of recent studies, most interventions meant to increase treatment adherence in ACS patients have been short-term and scattered rather than part of a complete, long-term care plan. While past studies have looked at post-discharge follow-ups and educational interventions, none have created and evaluated a continuous, methodical TCP spanning care from hospital admission through post-discharge follow-up. This work intends to design and apply a structured TCP to improve treatment adherence in ACS patients, so guaranteeing consistent, continuous, and well-coordinated treatment across their recovery path.

Methods

This randomized controlled clinical trial was conducted on 79 patients diagnosed with ACS who were admitted to Imam Reza Hospital in Mashhad, Iran, from August 2023 to February 2024. The study adhered to the ethical principles of the Declaration of Helsinki, and written informed consent was obtained from all participants or their legal guardians prior to participation. Participants were selected through convenience sampling among patients who met the inclusion criteria: a confirmed diagnosis of ACS by a cardiologist, age over 18 years, stable clinical conditions at the time of discharge, and the ability to communicate verbally. Exclusion criteria included unwillingness to continue participation, unstable clinical conditions, change in diagnosis during hospitalization, undergoing cardiopulmonary resuscitation (CPR), or death during hospitalization.

This study followed the CONSORT checklist for trials with randomization. An a priori sample size calculation was done depending on an expected medium effect size in view of the lack of direct studies directly evaluating the impact of a TCP on treatment adherence among ACS patients. Assumed was a conservative effect size of Cohen's d=0.7 following a thorough review of the literature and expert consultation. A two-tailed test with 95% confidence level and 80% power using this estimate produced a needed sample size of 32 participants per group. The ultimate target sample size was raised to 40 participants in each group (total N=80) to allow for an expected attrition rate of up to 20%. Therefore, 108 patients were evaluated for eligibility during recruitment; of these, 28 were disqualified for not meeting the inclusion criteria. Time-block randomizing eighty patients produced intervention and control groups. Final data from 39 intervention and 40 control patients result from one participant in the intervention group dying during follow-up (Figure 1).

After initial screening, a total of 80 eligible patients were enrolled and randomly allocated into intervention and control groups using time-block randomization. The randomization sequence was generated using Randomizer.org, and allocation concealment was ensured by using eight opaques, sealed, and sequentially numbered envelopes, each containing group assignment codes. One envelope was opened weekly to assign that week's participants according to the pre-determined sequence. Only the outcome assessor and data analyst were blinded to group allocation (single-blind design), as blinding participants was not feasible due to the nature of the educational intervention.

The study used a demographic questionnaire and a treatment adherence questionnaire developed by Ziaei et al. (2011). The treatment adherence questionnaire assesses three dimensions of adherence: diet, medication regimen, and activity. It consists of 26 Likert-scale questions, with the diet dimension covering 13 questions (maximum score: 46), the medication regimen six questions (maximum score: 24), and the activity pattern seven questions (maximum score: 18). The total score represents the degree of adherence, with higher scores indicating greater adherence. Ziaei et al. confirmed the content validity of the questionnaire, and its reliability was established with intra-class correlation coefficients: dietary adherence (r=0.86), medication regimen (r=0.90), and activity adherence (r=0.95) (24). Ziaei et al. (2011) first created a Persian original treatment adherence questionnaire. But the instrument underwent a face and content validity evaluation to guarantee the appropriateness of language and clarity for the present study population. Seven faculty members from the School of Nursing and Midwifery at Mashhad University of Medical Sciences examined the questionnaire and confirmed its relevance and simplicity for patients with ACS. To evaluate internal consistency, the instrument was also pilot-tested on ten individuals producing a Cronbach's alpha of 0.858, so suggesting reasonable dependability. Although the questionnaire was first written in Persian and no complete translation was needed, the research team guaranteed linguistic clarity and contextual fit for the present population by means of expert review and pre-testing.

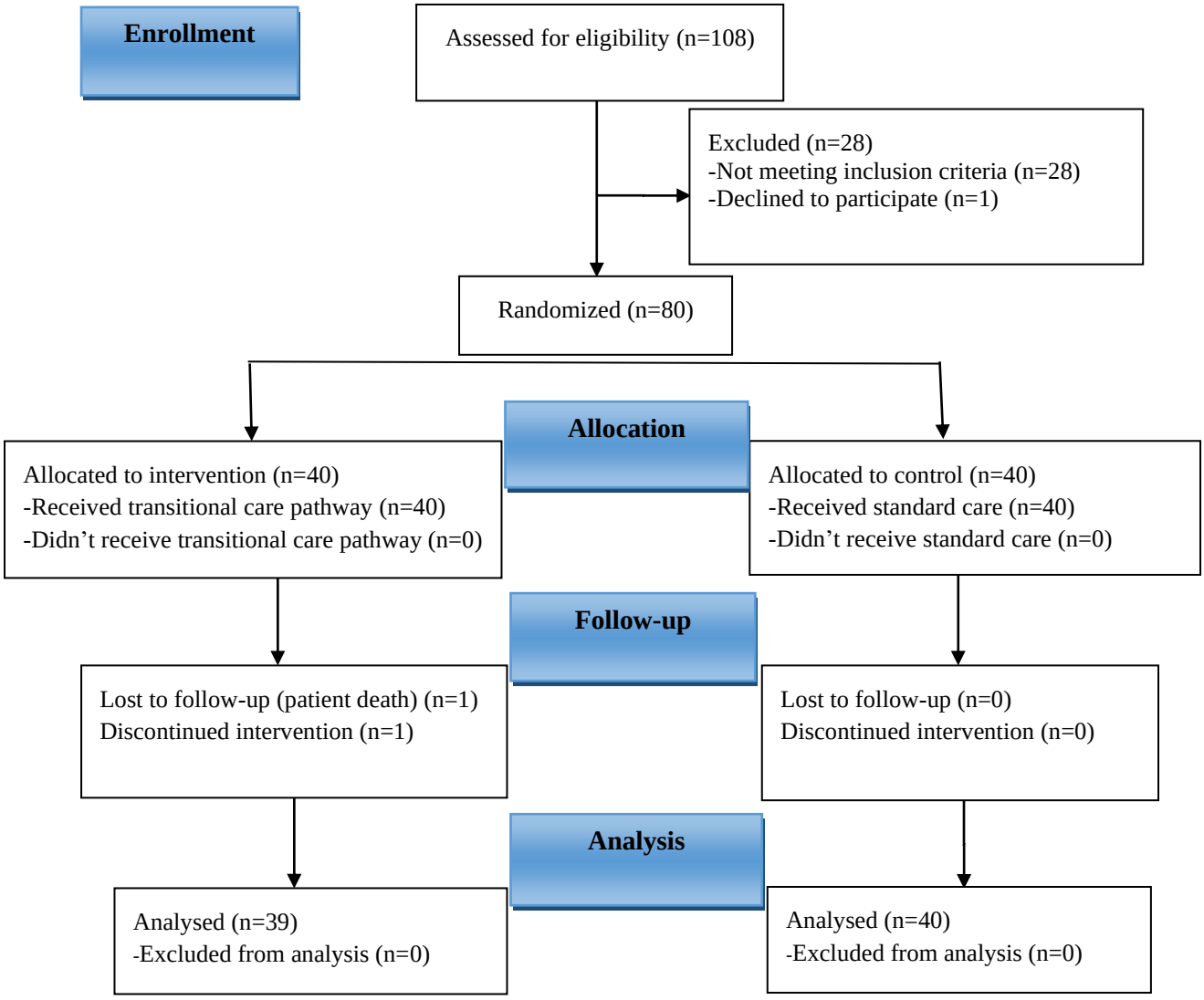

Figure 1. CONSORT Flow Diagram Depicting the Enrollment, Allocation, Follow-Up, and Analysis of Participants in the Randomized Controlled Trial

The intervention group comprised 40 patients who completed demographic and treatment adherence questionnaires during hospitalization. These patients received TCP interventions included educational sessions, the distribution of segmented pamphlets, and follow-up communications through weekly phone and online consultations to address patient queries. Routine care, following hospital protocols, was also provided by nurses under the researcher's supervision. One of the patients in the intervention group passed away during the one-month follow-up and was excluded from the final analyses.

TCP interventions were delivered at four key stages. The educational content in the TCP pamphlets was structured according to the framework by Ya-ping Xu et al. (25), answering the "5W1H" (When? Where? Who? What? Why? How?) questions across four-time intervals: at hospitalization, during hospitalization, at discharge, and one-month post-discharge (Table 1). Given that the researcher had no legal responsibility for performing certain interventions, such as pain relief and pre- and post-angiography care, these measures were carried out by the nursing staff. The researcher supervised the implementation of these interventions and ensured appropriate follow-up in each hospital ward. Other interventions were carried out by the researcher. The control group (n=40) completed the same demographic and treatment adherence questionnaires during hospitalization and in addition to routine care, they received standard care, including structured oral education and a pamphlet at discharge. This pamphlets was identical to the one used in the intervention group and was provided to patients based on Tuna et al.'s protocol (26); however, with the difference that in the intervention group, patients in each hospital ward got pamphlets and oral education in a scheduled way based on the TCP

protocol and according to the interventions undertaken. In contrast, in the control group, all information and pamphlets were supplied at a single point in time during hospitalization. patients in both groups completed the treatment adherence questionnaire again one month after discharge. Data analysis was performed with SPSS (version 20). P<0.05 was considered statistically significant.

Table 1. Description of the Structured Transitional Care Pathway Implemented for Patients with Acute Coronary Syndrome (ACS) in the Intervention Group

When	Where	Who	How	What	Why
At hospitalization	Emergency / CCU / post-angio	Researcher	Oral explanation /pamphlet /examination	✓ Pain relief ✓ Reducing the patient's anxiety ✓ Monitoring rhythm and hemodynamic ✓ Evaluation and initial examination of the patient ✓ Assessing the patient's needs and preferences ✓ Introduction of care team, introduction of ward facilities, hospital rules and regulations	Adjusting the patient to new conditions
During hospitalization	Emergency / CCU 1 to 4	Researcher	Oral explanation /pamphlet	✓ Angiography preparation ✓ Explanation of the cause and factors of disease occurrence ✓ Explanation of diagnostic methods ✓ Explaining the duration of hospitalization and treatment process ✓ Training to report danger signs to the nurse/doctor	Know about acute coronary syndrome care
	angiography	Researcher	Oral explanation /pamphlet	✓ Explain the planned actions to the patient ✓ Talk with the patient to reduce anxiety before the procedure	Proper preparation before the procedure
	CCU 1 to 4 / post-angio	Researcher	Oral explanation /pamphlet	✓ Care after angiography ✓ Monitoring of ACS complications ✓ Drug program ✓ diet ✓ physical activity	Accelerate recovery
At discharge	Post-Angio / CCU 1 to 4 / Post CCU	Researcher	Oral explanation /pamphlet	✓ Educate about cardiac rehabilitation ✓ Self-care and side effects monitoring ✓ Recognizing danger signs and taking appropriate action ✓ Bathing, smoking, driving, sexual activity ✓ Activity, start to work ✓ Periodic heart tests including check-up and heart examination ✓ Time to see a doctor ✓ Care of devices	Back to everyday life
Post discharge	Home	Researcher	Phone call and online follow-up	✓ Follow up on the patient's condition ✓ Answers to questions ✓ Examining danger signs ✓ Drug side effects and treatment adherence ✓ Observance of activity level and diet ✓ Regular visits to the doctor ✓ Follow up rehabilitation status ✓ Monitoring complications of acute coronary syndrome ✓ Indicators of the need for normal/emergency visits	Reduction of complications after discharge

Ethical Consideration

This study was approved by the anonymized (protocol code: IR.MUMS.NURSE.REC.1402.058). Additionally, we also registered our study protocol on the IRCT registry with the clinical trial code IRCT20220130053882N2, which is available at https://irct.behdasht.gov.ir/trial/71462. All participants were briefed on the study's objectives, procedures, and data confidentiality. Additionally, those who agreed to participate signed a written informed consent form.

Results

The demographic results are presented in Table 2. In the intervention group, the mean age was 57.43 ± 14.31 years, while in the control group was 57.48 ± 12.19 years.

Table 2. Baseline sociodemographic and clinical characteristics of participants

Variable	Intervention N (%), Mean ± SD	Control N (%), Mean ± SD	Test results
Age (years)	57.4 ± 14.3	57.5 ± 12.2	p=0.990*; t=0.1; df=77
Diagnosis			
Angina	15 (38.5)	17 (42.5)	p=0.695**
NSTEMI	13 (33.3)	15 (37.5)	$\chi2$=0.7
STEMI	11 (28.2)	8 (20.0)	df=2
Sex			
Male	18 (46.2)	21 (52.5)	p=0.573**; $\chi2$=0.3
Female	21 (53.8)	19 (47.5)	df=1
Marital status			
Single	2 (5.1)	0 (0)	
Married	29 (74.4)	32 (80.0)	p=0.519***
Divorce/death of spouse	8 (20.5)	8 (20.0)	
Education level			
Illiterate	7 (17.9)	7 (17.5)	p=0.818****
Mid-school education	20 (51.3)	22 (55.0)	z=0.818
High-school education	6 (15.4)	6 (15.0)	
University education	6 (15.4)	5 (12.5)	
Job status			
Employed	15 (38.5)	14 (35.0)	p=0.943**
Unemployed	17 (43.6)	18 (45.0)	$\chi2$=0.1
Retired	7 (17.9)	8 (20.0)	df=2
Type of insurance			
No insurance	12 (30.8)	9 (22.5)	p=0.417**
Rural-insurance	2 (5.1)	2 (5.0)	$\chi2$=2.8
Health-insurance	17 (43.6)	14 (35.0)	df=3
Social security	8 (20.5)	15 (37.5)	
Income level			
Less than enough	12 (30.8)	5 (12.5)	p=0.036****
Enough	27 (69.2)	34 (85.0)	z=2.1
More than enough	0 (0)	1 (2.5)	
Hospitalization frequency	3.0 ± 1.0	3.3 ± 1.1	p=0.863****; z=0.2
Frequency of hospitalization due to heart disease	1.9 ± 0.3	1.4 ± 0.3	p=0.200****; z=1.5
Duration of coronary artery disease (Months)	17.9 ± 7.1	12.1 ± 5.3	p=0.236****; z=1.3
Risk factors of heart disease			
Hypertension	24 (61.5)	23 (57.5)	p=0.715**; $\chi2$=0.1; df=1
Diabetes	12 (30.8)	12 (30.0)	p=0.941**; $\chi2$=0.006; df=1
Hyperlipidemia	16 (41.0)	19 (47.5)	p=0.562**; $\chi2$=0.3; df=1
Smoking	13 (33.3)	15 (37.5)	p=0.699**; $\chi2$=0.2; df=1
BMI>30	5 (12.8)	6 (15.0)	p=0.780**; $\chi2$=0.1; df=1
Family history	17 (43.6)	14 (35.0)	p=0.434**; $\chi2$=0.6; df=1
Medications			
Antihypertensive	13 (33.3)	16 (40.0)	p=0.539**; $\chi2$=0.4; df=1
Antiarrhythmic	5 (12.8)	6 (15.0)	p=0.780**; $\chi2$=0.1; df=1
Anticoagulants/antiplatelets	12 (30.8)	16 (40.0)	p=0.391**; $\chi2$=0.7; df=1
Antianginal	3 (7.7)	3 (7.5)	p=0.999 ***
Antihyperlipidemia	7 (17.9)	5 (12.5)	p=0.500**; $\chi2$=0.5; df=1
Other drugs	21 (53.8)	16 (40.0)	p=0.218**; $\chi2$=1.5; df=1

*Independent t test; **Chi-square test; ***Fisher's exact test; ****Mann-Whitney U test

Male patients constituted 46.2% of the intervention group and 52.5% of the control group. The majority of patients were diagnosed with angina (intervention: 38.5%; control: 42.5%). The most common educational level was middle school (intervention: 51.3%; control: 55.0%). Married patients outnumbered those who were single, divorced, or widowed (intervention: 74.4%; control: 80.0%).

In the pre-intervention phase, the mean total treatment adherence score was 49.56 ± 14.24 for the intervention group and 49.63 ± 12.75 for the control group, showing no significant difference (p=0.984). Post-intervention, the mean score for the intervention group increased to 66.97 ± 10.78, compared to 60.03 ± 12.16 for the control group, revealing a significant difference (p=0.009). Within-group comparisons indicated significant increases in total treatment adherence scores post-intervention for both groups (p<0.001) (Table 3). Pre-intervention, the mean diet treatment adherence score was 23.62 ± 9.58 in the intervention group and 24.08 ± 8.38 in the control group, with no significant difference (p=0.702). Post-intervention, the scores were 33.79 ± 6.64 for the intervention group and 29.55 ± 7.41 for the control group, demonstrating a significant difference (p=0.012). Both groups significantly increased diet treatment adherence scores post-intervention (p<0.001) (Table 3).

Table 3. Mean of treatment adherence scores in the intervention and control groups in patients with acute coronary syndrome (ACS)

Variable	Time of Measurement	Intervention (n=39) Mean ± SD	Control (n=40) Mean ± SD	Between-groups
Treatment adherence (Total)	Before intervention	49.56 ± 14.24	49.63 ± 12.75	p=0.984* t=0.02 df=77
	After intervention	66.97 ± 10.78	60.03 ± 12.16	p=0.009* t=2.68 df=77
	Within-group change (Post-Pre)	17.41 ± 9.70	10.40 ± 6.10	p<0.001** t=3.855 df=77
	Within-group	p<0.001**; t=11.2	p<0.001**; t=10.8	
Treatment adherence (Diet)	Before intervention	23.62 ± 9.58	24.08 ± 8.38	p=0.702*** z=0.4
	After intervention	33.79 ± 6.64	29.55 ± 7.41	p=0.012*** z=2.5
	Within-group change (Post-Pre)	10.18 ± 7.54	5.47 ± 3.97	p=0.003*** z= 2.9
	Within-group	p<0.001****; z=5.2	p<0.001****; z=5.4	
Treatment adherence (Activity)	Before intervention	10.62 ± 4.16	9.88 ± 3.54	p=0.313*** z=1.0
	After intervention	13.85 ± 2.92	11.53 ± 4.25	p=0.012*** z=2.6
	Within-group change (Post-Pre)	3.23 ± 3.96	1.65 ± 2.37	p=0.089*** z= 1.7
	Within-group	p<0.001****, z=4.1	p<0.001****, z=3.8	
Treatment adherence (Drug regimen)	Before intervention	15.33 ± 4.92	15.68 ± 4.62	p=0.676*** z=0.4
	After intervention	19.33 ± 4.12	18.95 ± 3.28	p=0.308*** z=1.0
	Within-group change (Post-Pre)	4.00 ± 3.28	3.28 ± 3.36	p=0.176*** z= 1.35
	Within-group	p<0.001****; z=5.0	p<0.001****; z=5.0	

*Independent t-test; ** Paired t-test; *** Mann-Whitney U test; **** Wilcoxon signed-rank

test

In the pre-intervention phase, the mean activity treatment adherence score was 10.62 ± 4.16 for the intervention group and 9.88 ± 3.54 for the control group, with no significant difference (p=0.313). After the intervention, the mean scores rose to 13.85 ± 2.92 in the intervention group and 11.53 ± 4.25 in the control group, with a significant difference (p=0.012). Within-group analysis indicated significant increases in activity treatment adherence scores for both groups post-intervention (p<0.001) (Table 3).

Pre-intervention, the mean drug regimen adherence score was 15.33 ± 4.92 in the intervention group and 15.68 ± 4.62 in the control group, with no significant difference (p=0.676). Post-intervention scores were 19.33 ± 4.12 for the intervention group and 18.95 ± 3.28 for the control group, indicating no significant difference (p=0.308). Within-group comparisons showed significant increases in drug regimen adherence scores after the intervention for both groups (p<0.001) (Table 3).

All factors identified by the researcher and previous literature as potential confounding variables (such as cardiovascular risk factors, age, gender, etc.) were included in the patient's demographic and background information forms. Statistical tests were conducted to assess differences between the two groups. Except for income level, there were no statistically significant differences in the demographic and background information between the intervention and control groups. In the control group, most individuals had an income level that was sufficient or above, whereas, in the intervention group, most individuals had an income level that was below or at the sufficiency level, resulting in a statistically significant difference between the two groups.

The results of the two-way ANOVA analysis regarding the impact of individual characteristics of patients with ACS on treatment adherence scores revealed that the variables of age, high cholesterol levels, and history of antianginal medication use had significant effects on patients' treatment adherence scores after the intervention. However, no significant interaction effects were found on treatment adherence scores following the intervention. Considering the heterogeneity of income levels, this variable was also assessed through the two-way ANOVA statistical test.

The two-way ANOVA results showed significant differences in overall treatment adherence scores based on group and age (p=0.038), with significant main effects for group (p=0.008) and age (p=0.038). No significant interaction effect was found (p=0.941). There were no significant differences in treatment adherence based on group and income (p=0.992), nor were there substantial effects for group (p=0.321) or income (p=0.992) alone, with no interaction effect (p=0.114). Significant differences were observed based on group and high cholesterol levels (p=0.036), with significant main effects for the group (p=0.019) and high cholesterol (p=0.036) but no interaction effect (p=0.936). Additionally, significant differences in treatment adherence scores were found based on group and history of antianginal medication use (p=0.033), with significant main effects for the group (p=0.035) and medication history (p=0.033) but no interaction effect (p=0.935).

Based on the post-intervention means and standard deviations, post hoc the observed effect size (Cohen's d) for the change in total treatment adherence score was computed: Mean in intervention = 66.97 ± 10.78, Mean in control = 60.03 ± 12.16 → Cohen's d≈0.61, so indicating a modest effect, which is consistent with the originally assumed effect size (d=0.7), so supporting the adequacy of the initial sample size estimation.

Discussion

This study investigated the effectiveness of TCP in enhancing treatment adherence among patients with ACS. Pre-intervention assessments indicated no statistically significant differences between the intervention and control groups. However, there was a notable improvement in treatment adherence scores following the intervention, encompassing total adherence, dietary adherence, and activity adherence within the intervention group. Conversely, changes in drug regimen adherence between the two groups post-intervention were insignificant. The Within-group analysis demonstrated statistically significant increases in total treatment adherence and all dimensions post-intervention for both groups. In this study, the intervention group received TCP in addition to routine care, which included nursing interventions per hospital treatment protocols and education provided by nurses during hospitalization and at discharge. In contrast, the control group received standard care in addition to routine care,

which involved structured oral education and a pamphlets at discharge, as described in the research by Tuna et al. (26), This pamphlets contained comprehensive information on heart anatomy, the processes of heart attacks, risk factors, symptoms, appropriate actions during an attack, diagnostics, treatments, lifestyle modifications, and medical interventions. A key component of the standard care was related to medications, including their side effects, administration methods, and mechanisms of action. The standard care approach appears to have significantly influenced treatment adherence scores, particularly regarding drug regimen adherence. As a result, no significant difference was observed between the two groups in medication regimen adherence post-intervention; however, adherence increased significantly in both groups compared to pre-intervention levels (11).

In this regard, in the quasi-experimental study by Azizi et al. (2020), which examined the impact of education on treatment adherence in patients with ACS, 70 patients in Zahedan were studied. The average adherence score in the intervention group increased and significantly decreased in the control group (11). This study utilized the same treatment adherence questionnaire as the current research. The difference in findings between Azizi's study and the present study seems to be related to the timing of the pre-test and post-test. Azizi et al. measured treatment adherence one month and three months post-intervention, while in the current study, the treatment adherence score was measured during hospitalization and one month after discharge. Azizi et al. demonstrated that educational interventions could effectively improve treatment adherence among patients with ACS, which aligns with the results of the present study.

Bruckert et al. (2020) conducted a retrospective cohort study involving 2,695 ACS patients to examine adherence to lipid-lowering therapies, finding that approximately 70% of patients adhered to such therapies, which falls below the desirable threshold (27). This research underscores the urgent need for strategies to enhance treatment adherence among ACS patients. Similarly, a clinical trial by Kamrani et al. (2015) in Iran assessed the effects of patient education and telephone follow-up by a nurse on treatment adherence among 90 angina patients. Results indicated significant improvements in treatment adherence across all groups post-intervention, particularly in those receiving education alone or education combined with telephone follow-up. In contrast, adherence in the control group did not significantly increase. Furthermore, this study demonstrated that treatment adherence outcomes were superior in the telephone follow-up group compared to the education-only group (28). Kamrani et al.'s findings align with the present study, highlighting that patient education and follow-up can effectively enhance treatment adherence scores.

Conversely, Daliri et al.'s (2022) study in the Netherlands, which investigated the impact of TCP on medication adherence in elderly heart patients, revealed no significant effect on medication regimen adherence in this population (21). These findings underscore that improving medication adherence behaviors is a multifaceted process influenced by a range of factors, including individual patient characteristics, family and cultural background, interactions with healthcare providers, and the healthcare system itself. In this context, research has shown that beliefs about illness, approaches to self-care, and attitudes toward medications can be shaped by historical context, cultural norms, family experiences, and personal preferences. These factors often involve complexities that extend beyond the conventional discussions of risks and benefits typically addressed during clinical encounters. Therefore, patients' concerns about their medications—and whether these concerns outweigh the perceived benefits—are critical issues that must be addressed in patient-provider communication (29). Based on this, it can be argued that a deep understanding of patients' cultural contexts is essential in designing transitional care interventions, in order to tailor such interventions to the patients' social and cultural environment.

Additionally, the present study found that age negatively impacts treatment adherence, with adherence decreasing as age increases. Kassab's research indicates that elderly individuals, unemployed patients, those with multiple concurrent health conditions, and individuals prescribed numerous medications are less likely to adhere to their prescribed medication regimens six months post-hospital discharge (30).

The present study's findings indicate a significant correlation between age, high cholesterol levels, and history of antianginal medication use with the mean treatment adherence scores. In a cross-sectional study conducted in Iran by Dianati et al. in 2019, which aimed to determine the levels of medication adherence and associated factors in cardiovascular patients after discharge, it was found that a substantial percentage exhibited moderate adherence, while a smaller proportion demonstrated

low and high adherence to treatment. This study also revealed significant relationships between medication adherence and factors such as education level, disease diagnosis, and sensory impairments (hearing and vision) (31).

These results suggest that without an intervention focused on medication education, patients tend to display low adherence to their prescribed regimens. However, the results of this study differ from those of Dianati et al., likely due to cultural and geographical differences, as well as variations in study design and sampling methods. One notable difference between the two studies may be the education level of the patients. In Dianati et al.'s study, over half of the patients were illiterate, whereas in the current study, only a tiny percentage of the intervention and control groups were illiterate. This disparity in education levels could significantly impact treatment adherence outcomes.

The observed relationships in the present study highlight the importance of considering demographic and clinical factors when designing interventions to improve treatment adherence. By addressing the specific needs and characteristics of the patient population, healthcare providers can enhance the effectiveness of educational programs and ultimately improve patient outcomes in managing cardiovascular conditions.

This study demonstrates that implementing TCP significantly enhances treatment adherence among patients with ACS. These findings underscore the potential of tailored transitional care interventions to improve patient engagement and adherence to prescribed therapies. The study emphasizes the importance of integrating TCPs into standard care protocols to foster better management of ACS, ultimately leading to improved patient outcomes. By providing organized assistance and educational resources from hospitalization through discharge, TCPs enable patients to adhere to medication schedules, dietary guidelines, and lifestyle adjustments. This comprehensive approach ensures continuity of care, reduces readmission rates, and enhances patient outcomes. Furthermore, TCPs promote communication between healthcare providers and patients, allowing for the timely addressing of issues and interventions, thus improving adherence and disease management.

This study has some limitations that should be acknowledged. Convenience sampling and a single-center design could restrict the generalizability of the results to more diverse populations with various geographic and cultural background. Though it offers first insights, the one-month follow-up period might not entirely capture the long-term results of the intervention. Though useful, self-reported adherence assessments could be affected by social desirability bias or recall. Given the body of current research on this subject, more investigation of contextual and cultural elements is justified to help to better understand the outcomes. To increase the evidence and relevance of results, future studies with multi-center environments, probability sampling, longer follow-up periods, and an emphasis on socio-cultural variables are advised. Several centers and longer follow-ups should be part of future research to increase generalizability and evaluate long-term consequences. To better customize treatments, one is advised to investigate cultural and socioeconomic influences and apply objective adherence criteria.

Implications for practice

Including a disciplined TCP into regular post-discharge treatment for ACS patients will greatly increase adherence to dietary and physical activity guidelines. Healthcare systems should offer targeted training programs for nurses and doctors on TCP protocols, create standardized patient education materials catered to local cultural settings, and make use of digital health tools including follow-up reminder apps or telehealth consultations to keep ongoing patient involvement. TCP should be included into multidisciplinary care teams and hospital discharge processes to support ongoing adherence even more, so enhancing secondary prevention and improving long-term clinical outcomes.

Acknowledgments

We want to thank all the participants who agreed to participate in this study. This study was approved by the Research Ethics Committees of the School of Nursing & Midwifery - Mashhad University of Medical Sciences (ethical code: IR.MUMS.NURSE.REC.1402.058). Additionally, we also registered our study protocol on the IRCT registry with the clinical trial code IRCT20220130053882N2 on date 09/08/2023 which is available at https://irct.behdasht.gov.ir/trial/71462.

Conflicts of interest

The authors state that there is no competing of interest in the present study.

Funding
This study was part of a thesis conducted at the School of Nursing and Midwifery, Mashhad University of Medical Sciences. The study received financial support from the Research Deputy of Mashhad University of Medical Sciences [grant number 4020448], which covered the research expenses but did not include funding for publication costs. The Research Deputy had no role in the design, collection, analysis, and data interpretation the study.

Authors' Contributions
AJ: Conceptualization, investigation, Writing - Original Draft. ND: Conceptualization, Review & Editing, Supervision. RM: Review & Editing. AE: Review & Editing. All authors have read and approved the final manuscript.

References
1. World Health Organization. Noncommunicable diseases [Internet]. Geneva: WHO; 2024 [cited 2025 Jun 25]. Available from: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases
2. Angell SY, McConnell MV, Anderson CA, Bibbins-Domingo K, Boyle DS, Capewell S, et al. The American Heart Association 2030 impact goal: a presidential advisory from the American Heart Association. Circulation. 2020;141(9):e120–38.
3. Hosseini K, Mortazavi SH, Sadeghian S, Ayati A, Nalini M, Aminorroaya A, et al. Prevalence and trends of coronary artery disease risk factors and their effect on age of diagnosis in patients with established coronary artery disease: Tehran Heart Center (2005–2015). BMC Cardiovasc Disord. 2021;21: 1–11.
4. Salari N, Morddarvanjoghi F, Abdolmaleki A, Rasoulpoor S, Khaleghi AA, Hezarkhani LA, et al. The global prevalence of myocardial infarction: a systematic review and meta-analysis. BMC Cardiovasc Disord. 2023;23(1):206–18.
5. Raghfar H, Sargazi N, Mehraban S, Akbarzadeh MA, Vaez Mahdavi MR, Vahdati Manesh Z. The economic burden of coronary heart disease in Iran: a bottom-up approach in 2014. J Ardabil Univ Med Sci. 2018;18(3):341–56.
6. Dadkhah-Tirani H, Hasandokht T, Agostoni P, Salari A, Shad B, Soltanipour S. Comparison of cardiovascular risk factors among coronary artery bypass graft patients in 2010 and 2016: a single-center study in Guilan province, Iran. ARYA Atheroscler. 2018;14(5):205–11.
7. Lane D, Carroll D, Ring C, Beevers DG, Lip GY. Mortality and quality of life 12 months after myocardial infarction: effects of depression and anxiety. Psychosom Med. 2001;63(2):221–30.
8. Marcum ZA, Sevick MA, Handler SM. Medication nonadherence: a diagnosable and treatable medical condition. JAMA. 2013;309(20):2105–6.
9. Niakan M, Paryad E, Shekholeslam F, Kazemnezhad Leili E, Assadian Rad M, Bonakdar HR, et al. Self-care behaviors in patients after myocardial infarction. J Holist Nurs Midwifery. 2013;23(2):63–70.
10. Shidfar M, Hosseini M, Shojaei Zadeh D, Asasi N, Majlesi F, Nazemi S. Effectiveness of an educational program on knowledge and attitudes of angina patients in Mashhad, Iran: results of an intervention. J Birjand Univ Med Sci. 2007;14(1):9–15. (Persian)
11. Azizi HR, Yousefian Miandoab N, Yaghoubinia F. Effect of teach-back on treatment adherence in patients with acute coronary syndrome: a semi-experimental study. J Mazandaran Univ Med Sci. 2020;30(190):44–55.
12. Zakerimoghadam M, Ebrahimi S, Haghani H. The effect of self-management program after discharging on therapeutic adherence in patients with ischemic heart disease. Iran J Nurs Res. 2016;11(1):17–24.
13. Taghizadeh-Valdi T, Kazemnezhad Leili E. Treatment seeking behavior and related factors in patients with acute coronary syndrome. J Holist Nurs Midwifery. 2016;26(2):38–48.
14. Negara CK. The effect of discharge planning on treatment adherence among the elderly with hypertension in Banjarmasin, South Kalimantan. Int Conf Public Health (ICPH) [Internet]. 2018

Aug 30 [cited 2025 Jun 23];3(2):237. Available from: https://theicph.com/index.php/icph/article/view/652
15. Villanueva T. Transitioning the patient with acute coronary syndrome from inpatient to primary care. J Hosp Med. 2010;5(Suppl 4): S8–14.
16. Davies S. Transitional care for the cardiac surgery population: development of a clinical practice guideline [dissertation]. Minneapolis: Walden University; 2018. Walden Dissertations and Doctoral Studies. 5068. Available from: https://scholarworks.waldenu.edu/dissertations/5068
17. Harrison JD, Auerbach AD, Quinn K, Kynoch E, Mourad M. Assessing the impact of nurse post-discharge telephone calls on 30-day hospital readmission rates. J Gen Intern Med. 2014;29(Suppl 1):1519–25.
18. Coleman EA, Smith JD, Frank JC, Eilertsen TB, Thiare JN, Kramer AM. Development and testing of a measure designed to assess the quality of care transitions. Int J Integr Care. 2002;2(2). doi: 10.5334/ijic.60
19. Coleman EA, Boult C. Improving the quality of transitional care for persons with complex care needs. J Am Geriatr Soc. 2003;51(4):556–7.
20. Verhaegh KJ, MacNeil-Vroomen JL, Eslami S, Geerlings SE, de Rooij SE, Buurman BM. Transitional care interventions prevent hospital readmissions for adults with chronic illnesses. Health Aff (Millwood). 2014;33(9):1531–9.
21. Daliri S, Kooij MJ, Scholte op Reimer WJ, Ter Riet G, Jepma P, Verweij L, et al. Effects of a transitional care programme on medication adherence in an older cardiac population: a randomized clinical trial. Br J Clin Pharmacol. 2022;88(3):965–82.
22. Arnaert A, Ponzoni N. Happening/L'événement—Reflections on a Canadian online telehealth course: going forward with telehealth nursing. Can J Nurs Res. 2015;47(1):73–6.
23. Forouzesh M, Sanagoo A, Ghavidel A, Vakili MA, Jouybari L, Araghian Mojarad F. The effect of telenursing (telephone follow-up) after discharge on readmission due to complications after coronary artery bypass graft surgery. Nurs Midwifery J. 2017;15(8):584–94.
24. Heydari A, Ziaee ES, Ebrahimzade S. The frequency of rehospitalization and its contributing factors in patients with cardiovascular diseases hospitalized in selected hospitals in Mashhad in 2010. Intern Med Today. 2011;17(2):65–71.
25. Xu YP, Zhao PY, Bai YT, Li S. The effect of care transition pathway implementation on patients undergoing joint replacement during the COVID-19 pandemic: a quasi-experimental study from a tertiary care hospital orthopedic department in Beijing, China. J Orthop Surg Res. 2021;16(1):1–5.
26. Tuna S, Pakyüz SÇ. The effectiveness of planned discharge education on health knowledge and beliefs in patients with acute myocardial infarction: a randomized controlled trial. Ir J Med Sci. 2021;190: 1–8.
27. Bruckert E, Desamericq G, Khachatryan A, Ngo P, Gusto G, Sorio-Vilela F. Patient characteristics, treatment patterns, and adherence to lipid-lowering therapies following an acute coronary syndrome. Rev Cardiovasc Med. 2020;21(4):643–50.
28. Kamrani F, Nikkhah S, Borhani F, Jalali M, Shahsavari S, Nirumand-Zandi K. The effect of patient education and nurse-led telephone follow-up (telenursing) on adherence to treatment in patients with acute coronary syndrome. Cardiovasc Nurs J. 2015;4(3):16–24.
29. McQuaid EL, Landier W. Cultural issues in medication adherence: disparities and directions. J Gen Intern Med. 2018;33(Suppl 1):200–6.
30. Kassab Y, Hassan Y, Abd Aziz N, Ismail O, AbdulRazzaq H. Patients' adherence to secondary prevention pharmacotherapy after acute coronary syndromes. Int J Clin Pharm. 2013;35(2):275–80.
31. Dianati M, Taghadosi M. Medication adherence rate and related factors in patients with acute coronary syndrome after discharge from Shahid Beheshti Hospital in Kashan during 2017–2018. Feyz J Kashan Univ Med Sci. 2019;23(2):201–8.