Effectiveness of a Transitional Care Support Program for People with Heart Failure: A Randomized Controlled Trial

Ratchaneekorn Sunonnam, Apinya Siripitayakunkit, Soontaree Jianvitayakij*

Abstract: Heart failure is a chronic condition that impacts the health, well-being, and quality of life of people with heart failure. Living with heart failure requires consistent and effective self-care for preventing rehospitalization. Research on transitional care interventions that integrate evidence-based practice is limited, and its combined impact justifies further rigorous investigation. This randomized controlled trial aimed to examine the effects of a transitional care support program on self-care behavior, quality of life, and hospital readmission in people with heart failure at a tertiary hospital in northeastern Thailand. Sixty-six participants were randomly assigned to the experimental group (n = 33) and the comparison group (n = 33) using a computer-generated simple randomization sequence. The experimental group received a four-week Transitional Care Support Program developed by the researchers, in addition to usual care, while those in the comparison group received only usual care. Data were collected at three time points: baseline, immediately post-intervention (week 4), and eight weeks after the program ended (week 12), using the Demographic and Health Record Form, the Self-Care of Heart Failure Index, and the Minnesota Living with Heart Failure Questionnaire. Data were analyzed using descriptive statistics, a mixed-design repeated measures analysis of variance, and the Chi-square test.

The results revealed that the experimental group had significantly higher self-care behavior and quality of life than the comparison group. Furthermore, the experimental group had a significantly lower number of hospital readmissions within 28 days after discharge than the comparison group. Advanced practice nurses can play a vital role in implementing this program for people with heart failure during the transition from hospital to home. However, further testing with a larger sample size and in various settings is needed before the program can be widely adopted.

Keywords: Advanced practice nurse, Heart failure, Hospital readmission, Quality of life, Self-care behavior, Thailand, Transitional care

Received 27 March; Revised 29 May 2025; Accepted 30 May 2025

Author contributions:

RS: Conceptualization and design, acquisition of data, analysis and interpretation of data, drafting of the article, and final approval of the submitted version

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https://doi.org/ 10.60099/prijnr.2025.274482

Introduction

Heart failure (HF), a chronic condition, is a major global public health concern, affecting an estimated 64 million people worldwide. HF prevalence is projected to rise due to an aging society, increased cardiovascular and metabolic diseases, and improved survival from cardiovascular disease care, including in Thailand.[1] Consequently, these factors contribute to the growing number of people with HF (PW-HF), who may be prone to hospital readmission and increased hospital mortality.[2]

HF exacerbation presents with dyspnea, fatigue, reduced activity tolerance, and ankle swelling.[3] If untreated or not appropriately managed, HF can become life-threatening, with the highest risk of mortality and hospital readmission occurring within the first three months post-discharge.[4] Recurrent hospital readmissions are often linked to insufficient knowledge of HF management, inadequate self-care, and poor treatment adherence.[5-7] Restricting sodium intake is one of the challenging self-care behaviors for Thais. Thailand's first nationwide survey using 24-hour urinary analysis found that adults in the northeastern region consumed an average of 3,320 mg of dietary sodium daily.[8] This amount is nearly double the World Health Organization's recommended sodium intake of 2,000 mg daily.[9] This high sodium consumption is primarily attributed to the prevailing eating culture in Thailand's northeast, which favors high-sodium foods and seasonings, coupled with a general lack of awareness regarding personal sodium intake. Similar to the general population, PW-HF in this region tend to adopt the same eating habits as their family members.[10]

Excess sodium intake exacerbates HF, leading to increased blood pressure, disease progression, and hospital readmission.[9] Despite existing discharge self-care education for Thai PW-HF, many still struggle with self-care, especially regarding sodium restriction.[10] Furthermore, early readmission within 30 days after hospital discharge indicates incomplete treatment, suboptimal coordination of healthcare services, inadequate discharge strategies, and insufficient access to early follow-up services.[11]

An essential goal of nursing care for PW-HF is to prevent HF exacerbation by enhancing self-care abilities and ensuring continuous follow-up, which requires PW-HF cooperation to adapt to health behaviors appropriately and adhere strictly to the treatment plan. Successful care models must adopt an integrated approach, starting pre-discharge, that focuses on patient-centered medical guidance and continuous follow-up, such as transitional care,[12] leading to sustained, appropriate self-care behaviors in PW-HF[13-14] and effectively reducing hospital readmission,[15-16] ultimately resulting in a better quality of life.[17-18]

A transitional care program provides support from pre-hospital discharge to home care, ensuring continuity of care and long-term treatment adherence for patients.[18] Although previous studies evaluated immediate outcomes of transitional care programs in Thailand,[13-14] limited research has evaluated their long-term effects.[17] Additionally, no specific material regarding sodium restriction aligns with the lifestyle of PW-HF in the northeast region of Thailand. Therefore, this study aimed to develop and test a Transitional Care Support (TCS) Program to fill the gap by incorporating follow-up measures at 12 weeks post-discharge, focusing on missing content regarding food restriction, particularly salty diets.

Conceptual Framework and Literature Review

The conceptual framework of this study was developed based on the Transitional Care Model (TCM)

by Naylor et al.[19] and a review of evidence-based knowledge from high-level evidence. According to Naylor et al.,[19] transitional care emphasizes the critical nature of the patient transition phase, outlining a care model through a two-phase process: 1) hospitalization and pre-discharge, and 2) post-discharge continuous care. The TCM, which consists of ten key components—including hospital-to-home service delivery, risk screening, self-management education, patient and caregiver engagement, advanced practice nurses (APNs) roles, collaborative teamwork, care coordination, symptom and risk management, continuity promotion, and relationship maintenance—has been shown in numerous studies to improve the care and outcomes for chronically ill transitioning from hospital to home.[19]

According to the American Heart Association (AHA), PW-HF face a particularly vulnerable period when transitioning from hospital to home, necessitating complex care due to factors like advancing HF, the titration period of guideline-directed medical therapy, co-existing conditions, and the high potential for readmission within the initial one to three months post-discharge.[20] Effective HF disease management, delivered and coordinated by specialized nurses in HF, who are best suited, should include clearly communicating transitional care plans before hospital discharge. These plans should address precipitating factors of worsening HF, medical therapy as planned, health education, and self-care behaviors, such as diet, activity, weight monitoring, and cardiac rehabilitation for the patient and their family, with early post-discharge follow-up combined with structured contact (video, telephone, or face to face) with patients within seven days.[20] Also, the AHA's and the Heart Failure Association of the European Society of Cardiology (ESC) recommendations suggest that careful follow-up visits are conducted in the six weeks immediately following a HF hospitalization to mitigate the risk of subsequent readmission or death from HF.[3,21] Nurse-led transitional care interventions significantly lowered hospital readmission rates, particularly when follow-up extended beyond 12 weeks post-discharge.[22] A Cochrane systematic review also suggests that exercise programs show potential to decrease the risk of all-cause and HF-specific hospital readmission, and might improve the quality of life.[23] Further, healthcare professionals managing the transitional care of PW-HF must adopt a culturally sensitive approach, carefully considering language, communication styles, and the suitability of educational materials.[24]

Research indicates that effective transitional care interventions for PW-HF involve several key components. These include thorough discharge planning, providing clear information, optimizing medication regimens, offering psychological support, and training patients and caregivers in self-management skills. Crucially, such interventions emphasize continuous HF symptom monitoring and a rapid response to any worsening conditions.[25-27] Furthermore, successful transitional care involves actively involving both patients and their caregivers,[26-27] integrating care across hospitalization and post-discharge periods through various contact methods, including in-person visits, telehealth (e.g., smartphones, video calls, and the LINE application), and frequent follow-up.[25-28] Numerous studies have demonstrated that these interventions positively impact functional abilities,[26-27,29] improve HF self-care practices and symptom monitoring,[26,28] and enhance patients' quality of life.[26-29] Additionally, these interventions have been shown to reduce HF-specific[28-29] and all-cause readmissions,[25-28] emergency department visits,[25,28] hospital length of stay,[28] and psychological distress.[26,29]

HF management, particularly in low- and middle-income countries such as Thailand, can be suboptimal[25] due to fragmented services and coordination

gaps across healthcare settings. For example, the previous data showed that the average hospital stays for Thai HF patients increased from 5 days in 2013[2] to 14.2 days in 2021.[1] Furthermore, 2019 data from two northeastern Thai hospitals showed 30-day and 60-day HF readmission rates of 23.9% and 50%, respectively. The Transitional Care Support (TCS) Program was designed by the researchers and evaluated to address these issues in northeastern Thailand. This program integrated components of TCM with evidence-based HF literature, aiming to improve patients' self-care behaviors, quality of life, and reduce hospital readmissions.

Aim and Hypotheses

This study aimed to examine the effects of a TCS program for PW-HF. The hypotheses were: 1) the mean self-care behavior score and quality of life score in the experimental group would be higher than those in the comparison group; 2) the proportion of hospital readmissions within 28 days post-discharge in the experimental group would be lower than in the comparison group.

Methods

Design: This study employed a randomized controlled trial (RCT) design with three repeated measurements and a single-blind approach, in which the research assistant (outcome assessor) was unaware of the group status. This report followed the Consolidated Standards of Reporting Trials (CONSORT) statement checklist.

Sampling and Setting: This study was conducted in the general medicine wards of a tertiary care hospital in northern Thailand. The inclusion criteria included a confirmed HF diagnosis, being classified as New York Heart Association (NYHA) functional class II or III, having stable clinical conditions, being able to communicate via telephone and the LINE application, and being at least 18 years old. For older adults over 60, cognitive screening was required using the Thai Six-item Cognitive Impairment Test (6-CIT) to assess cognitive impairment in this population. This test evaluates cognitive function by assessing calculation skills, short- and long-term memory, environmental perception, perception of current events, and recall ability. A score of 7 or less indicates cognitive integrity.[30] The exclusion criteria included participants who experienced condition deterioration during hospitalization, withdrew, or received other care programs during the research period. Participants who volunteered for other research projects were excluded from this study.

The sample size was determined using the power analysis method and calculated for an ANOVA test with repeated measures and within-between interaction using the G*Power 3.1.9.4 software, with a significance level set at 0.05, and the test power was 0.80. The effect size 0.172 (small to medium) was determined based on a previous study,[31] conducted in Hong Kong, where the cultural context is considered close to the Thai context, compared to studies from other parts of the world. The minimum required sample size was 56 participants. However, considering the potential for sample attrition, the sample size increased by 15%,[32] resulting in a minimum required sample size of 65, rounded to 66. After obtaining informed consent, the participants were randomly assigned to either the experimental group (n = 33) or the comparison group (n = 33) using a computer-generated simple randomization sequence. Allocation concealment was maintained by placing the randomization sequence in sealed, opaque envelopes opened only after enrollment. The flow of participants through the trial is shown in **Figure 1**.

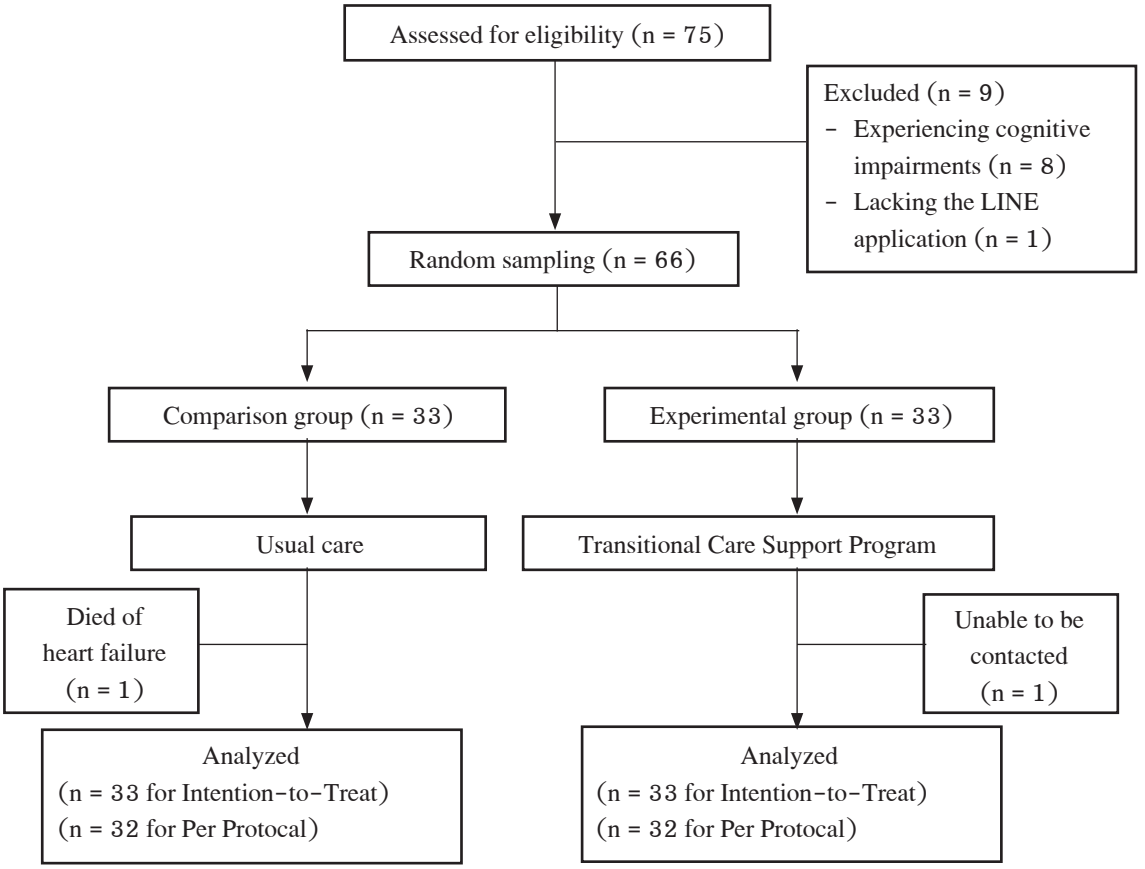

Figure 1. Flow diagram of the participants in the study

Ethical Considerations: This study was approved by the Institutional Review Board (IRB) on the Human Research Ethics, Faculty of Medicine Ramathibodi Hospital, Mahidol University, under the approval code MURA2022/497 and the Human Research Ethics Committee, Maharat Nakhon Ratchasima Hospital under the approval code 124/2022, and the Thai Clinical Trials Registry ID: TCTR20250319006. All participants were fully informed about the research objectives, procedures, data collection process, potential benefits, and risks. They were assured of their right to participate, refuse, or withdraw from the study at any time without affecting their medical treatment. Participants were encouraged to ask questions before providing informed consent. Those who agreed to participate signed a consent form, with their caregivers serving as witnesses. All data were kept confidential, and study results were reported in an aggregated form to prevent the disclosure of personal information.

Instruments: The research instruments consisted of two parts: 1) the data collection instruments, and 2) the research implementation instrument.

The Demographic and Health Record Form developed by the primary investigator (PI) comprises two parts: 1) Patient characteristics, which participants answer on their own, including gender, age, education level, and caregivers; and 2) Health information and medical history, recorded by the PI, including underlying

diseases, causes of HF, left ventricular ejection fraction, severity of HF, types of HF, medication use, disease duration, and hospital admissions for HF in the past year.

The Self-Care of Heart Failure Index (SCHFI) Version 7.2 was developed by Riegel and colleagues[33] to assess self-care behaviors of PW-HF. The SCHFI was translated into Thai by Damrongratnuwong and Masingboon.[34] It was used with permission from the original author. The 29-item scale measures the frequency of self-care that PW-HF performs daily in the following subdomains: Self-care Maintenance includes 10 items, e.g., "*Eat a low-salt diet*," Symptom Perception consists of 11 items, e.g., *"Check your ankles for swelling?",* and Self-care Management has eight items, e.g., *"Reducing your fluid intake?"* In addition, a self-care confidence item is included but not used in the total score calculation. Because each part has an unequal number of items, scores for each section are transformed to a 100-point scale, with a score of 70 or greater indicating appropriate self-care behavior. For the pilot study, the instrument's reliability was tested with 10 PW-HF who shared similar characteristics with the main study participants. The Cronbach's alpha coefficient for the SCHFI was 0.93 in the pilot and 0.89 in the main study (n = 66), both demonstrating acceptable internal consistency.

The Minnesota Living with Heart Failure Questionnaire (MLHFQ) was developed by Rector et al.[35] and translated into Thai by Tangsatitkiat and Sakthong using the forward and backward translation method.[36] It was used with permission from both original authors and translators to assess the impact of HF and its treatment on the physical and mental aspects of life, emotions, and an individual's economic and social factors over the past month. The 21-item scale is categorized into three sections: physical dimension (8 items), emotional dimension (5 items), and uncategorized questions (8 items). An example item is "*Walking or climbing stairs is difficult.*" The possible total scores range from 0 to 105 points. Higher scores indicate greater impairment in quality of life (QOL). The interpretation of MLHFQ scores from other QOL measurements; therefore, the PI reversed the scoring for ease of interpretation. Thus, higher scores indicate a lesser impairment of HF or better QOL. For the pilot study, the instrument's reliability was tested with 10 PW-HF who shared similar characteristics with the main study participants. The Cronbach's alpha coefficient for the MLHFQ was 0.83 in the pilot and 0.94 in the main study (n = 66).

Hospital readmission is defined as an event when a patient, having been discharged from a hospital, is subsequently readmitted within a defined time interval. In this study, hospital readmission specifically referred to participants' subsequent admission to a hospital within 28 days after their initial discharge, either due to exacerbation of HF or other HF-related causes.[37] Notably, while the terms "hospital readmission" and "rehospitalization" are often used interchangeably, "hospital readmission" is typically preferred when referring to formal quality indicators.

A Transitional Care Support Program (TCS program) for People with Heart Failure and Implementation

The TCS program was developed by the researchers. It incorporated nursing activities aligned with transitional care guidelines and evidence-based knowledge. The content, delivery method, and dose of early post-discharge management were guided by the AHA's and the Heart Failure Association of the ESC's recommendations.[3,12,20] This included an intervention duration of at least one hour of health education with patients and their caregivers, and a minimum of four follow-up visits conducted within 1-2 weeks post-discharge. This TCS program was a four-week program and consisted of eight structured activities: three sessions during hospitalization (60-90 minutes) and five follow-up sessions at 2nd, 7th, 14th, 21st, and 28th day post-discharge (10-15 minutes each). The implementation process relies on the ten components

of the TCM. The program consists of two phases: Phase 1, which includes hospitalization and pre-discharge. The PI initiated the TCS program by assessing participants' existing knowledge of HF, precipitating factors for worsening HF, and self-care behaviors. Subsequently, this phase prioritizes educating PW-HF and their caregivers, promoting appropriate self-care practices, and educating them to monitor alert signs and symptoms upon discharge, while also developing essential self-care skills. The aim is to enhance disease awareness and prevent hospital readmission.[20,25-27] Phase 2: Continuous post-discharge care. This phase aims to promote ongoing self-care, effective symptom management, and adherence to the treatment plan. It encompasses collaborative teamwork, coordinating care, resource benefits, and conducting follow-up visits via telephone and the LINE application platform.[27] Early post-discharge follow-up has become increasingly vital for PW-HF and their families. This phase enables symptom evaluation, which significantly enhances patients' self-confidence in managing and adhering to self-care behaviors, lifestyle modifications, and medications. Ultimately, these integrated efforts consistently led to an improved quality of life.[20,24]

Three experts validated the TCS program. These included a nursing instructor with expertise in cardiovascular disease care, an APN specializing in nursing care for PW-HF, and a cardiologist. Additionally, the PI developed a handbook on sodium content in seasonings and food, as well as a self-care record form, which was refined based on expert feedback. The program implementation details are provided in the **Appendix, Table A1.**

Usual Care: PW-HF in the comparison group received usual care from registered nurses in general medicine wards. Based on their clinical judgment and experience, nurses provided heart failure education and self-care recommendations during the discharge planning process.

Data Collection: Data were collected from December 2022 to April 2023, following IRB approval. Nurses in the medical inpatient wards identified potential participants, while the PI screened and recruited those who met the inclusion criteria. Before data collection, the PI thoroughly trained a research assistant, a professional nurse holding a master's degree in nursing science, in all data collection procedures. A single-blind protocol was employed in this study, meaning that the research assistant (data collector) was blinded to the treatment allocation. This measure was crucial for mitigating potential bias during data collection and enhancing the reliability of the study's outcomes. Conversely, the PI was aware of the group assignments and personally delivered the TCS program. Personal and health data were collected as baseline data. Self-care behavior and quality of life were assessed at three time points: at baseline, immediately post-intervention (week 4), and eight weeks post-program completion (week 12). Additionally, hospital readmission data were tracked for 28 days post-discharge.

Data Analysis: Data were analyzed using a statistical software program. Descriptive statistics were used to summarize personal and health-related data. Baseline differences between the two groups were assessed using the independent t-test, Mann-Whitney U test for continuous variables, the Chi-square test, or Fisher's exact test for categorical variables. A mixed-design repeated measures analysis of variance (ANOVA) with a Bonferroni post-hoc test was used to compare the mean scores of self-care behaviors and quality of life over time. A preliminary analysis was conducted to examine statistical assumptions, including the Shapiro-Wilk test for normality ($n < 50$), Levene's test for homogeneity of variances, and Mauchly's test of sphericity for compound symmetry. All assumptions were met, except the sphericity assumption. Thus, the Greenhouse-Geisser test, with adjusted degrees of freedom, was applied to examine group differences.

Readmissions within 28 days post-discharge were compared between groups using the Chi-square test. Statistical significance was set at 0.05. Analyses were initially conducted using the intention-to-treat (ITT) approach to account for dropouts and maintain the integrity of randomization. Given the minimal missing data (one case/group), missing values were imputed using the last observation carried forward (LOCF) method, assuming stability in the last recorded outcome. This method enables researchers to accurately determine the effectiveness of an intervention.[38] A sensitivity analysis using a per-protocol approach with 32 participants per group was conducted. The findings from ITT and per-protocol analyses were compared. The ITT and per-protocol effect estimates provided consistent results, supporting the robustness of the results. Therefore, the results of this study were reported using the ITT analysis.

Results

Participant characteristics and health data

There were 66 participants in total, with 33 in each group. Eight weeks after the program ended (week 12), one participant from the experimental group dropped out after becoming unreachable post-discharge, while another from the comparison group died. Despite this, the attrition rate remained minimal in both groups (3.03%). For data analysis, all 66 participants were included in the analysis of self-care behaviors and quality of life, but 64 participants were included in the analysis of hospital readmission. The personal characteristics, health-related data, and baseline self-care behavior and quality of life scores of both groups were compared. No statistically significant differences were found ($p > 0.05$), as shown in **Table 1.**

Table 1. Comparison of personal characteristics and health-related data between the experimental and comparison groups (n = 66)

Characteristics	Experimental group (n = 33)		Comparison group (n = 33)		Statistical values	p-value
	n	%	n	%		
Age (years)					0.288[a]	0.774
Mean ± SD	60.55 ± 8.76		61.27 ± 11.55			
Min-Max	42-82		30-83			
Gender					0.061[b]	0.805
Male	16	48.5	18	54.5		
Female	17	51.5	15	45.5		
Education					0.614[b]	0.433
< High school	24	72.7	20	60.6		
≥ High school	9	27.3	13	39.4		
Caregiver for long-term care						0.613[c]
Have	30	90.9	32	97.0		
Do not have	3	9.1	1	3.0		
Underlying disease*						
Hypertension	22	66.7	19	57.6	0.258[b]	0.612
Diabetes mellitus	18	54.5	14	42.4	0.546[b]	0.460
Cardiovascular diseases	13	39.4	20	60.6	2.182[b]	0.140
Chronic kidney disease	8	24.2	5	15.2	0.383[b]	0.536
Dyslipidemia	3	9.1	8	24.2	1.745[b]	0.186

Table 1. Comparison of personal characteristics and health-related data between the experimental and comparison groups (n = 66) (Cont.)

Characteristics	Experimental group (n = 33)		Comparison group (n = 33)		Statistical values	p-value
	n	%	n	%		
Causes of HF						0.708[c]
Cardiac causes	28	84.8	30	90.9		
Noncardiac causes	5	15.2	3	9.1		
LVEF[**]					0.531[a]	0.598
Mean ± SD	38.52 ± 13.73		40.35 ± 14.24			
Min-Max	15-61		19-65			
Types of HF					0.246[b]	0.620
HF with reduced ejection fraction	20	60.6	17	51.5		
HF with preserved ejection fraction	13	39.4	16	48.5		
NYHA[***] Functional Classification					3.341[b]	0.068
Class II	18	54.5	26	78.8		
Class III	15	45.5	7	21.2		
Medications received to treat HF[****]						
Diuretics	28	84.8	27	81.8	< 0 .001[b]	1.000
Beta-Blockers	20	60.6	17	51.5	0.246[b]	0.620
Angiotensin-converting enzyme inhibitors (ACEI)	15	45.5	13	39.4	0.062[b]	0.803
Hospital admissions within the past 1 year					< 0.001[b]	1.000
Min-Max	1-6		1-4			
1 time	19	57.58	20	60.61		
2-6 times	14	42.42	13	39.39		
Duration of disease (Days)					-0.135[d]	0.892
Median ± Sum of ranks	60.00 ± 1116.00		30.00 ± 1095.00			
Min - Max	8-1460		4-1460			
Baseline self-care behavior					0.335[a]	0.739
Mean ± SD	16.96 ± 7.01		17.51 ± 6.94			
Min - Max	4-33		6-37			
Baseline quality of life					1.50[a]	0.139
Mean ± SD	27.30 ± 4.62		29.25 ± 5.85			
Min-Max	19-37		18-40			

Note. [a] = Independent t-test, [b] = Chi-square test, [c] = Fisher's exact test, [d] = Mann-Whitney U Test, HF = Heart failure, [*]One person might have more than one underlying disease, [**]LVEF = Left ventricular ejection fraction, [***]NYHA = New York Heart Association, [****]One person received more than one medication.

Effects of the TCS Program on Self-care Behaviors and Quality of Life

After implementing the TCS program, the mean self-care behavior and quality of life scores in the experimental group increased significantly immediately after the program ended (week 4) and remained high post-discharge (week 12). However, in the comparison group, the mean self-care behavior and quality of life scores also increased initially but declined post-discharge (**Figures 2** and **3**).

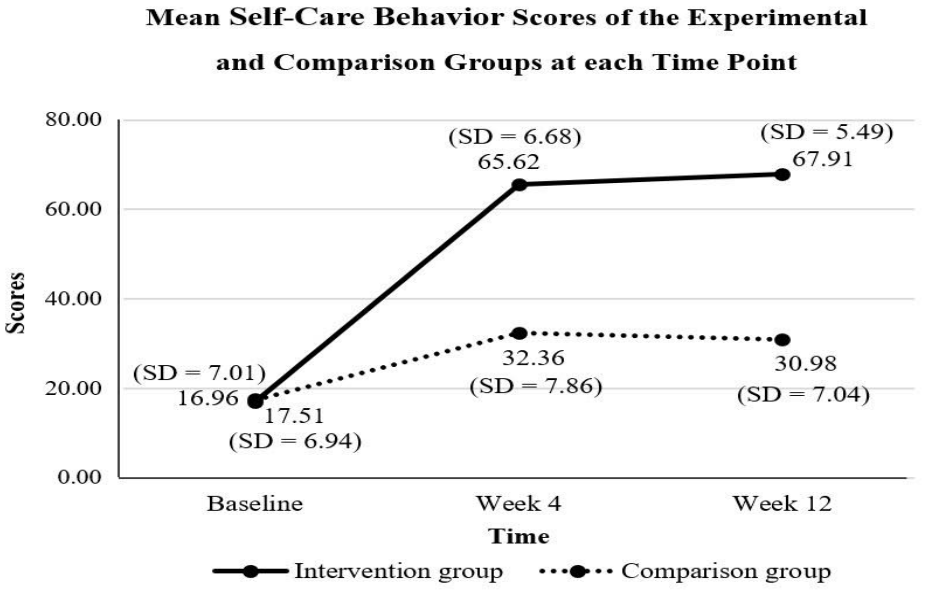

Figure 2. Comparison of self-care behavior between groups at each time point (n = 66)

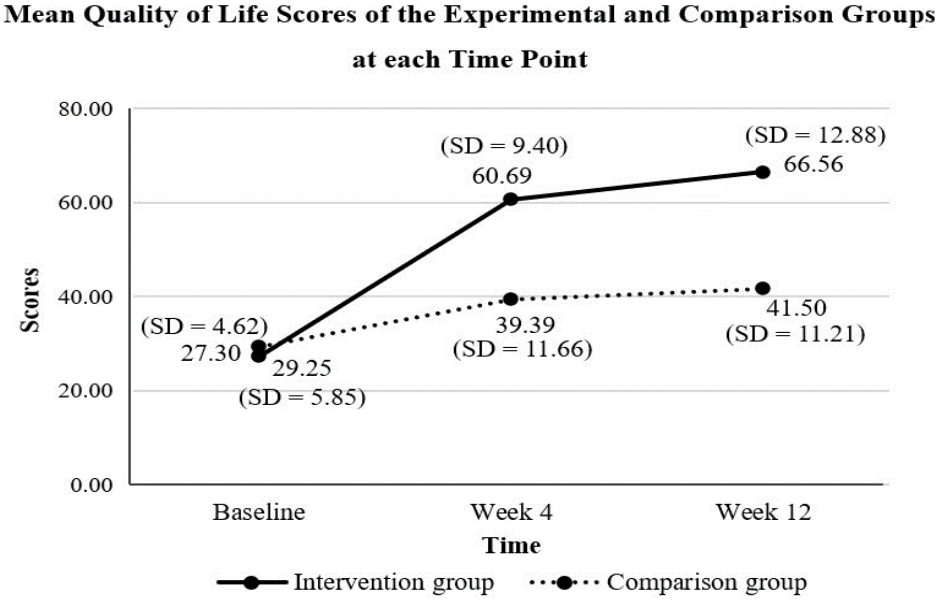

Figure 3. Comparison of quality of life between groups at each time point (n = 66)

A mixed design, repeated measures ANOVA with partial eta squared was conducted to analyze changes in self-care behavior and quality of life scores over time. The results demonstrated statistically significant differences between the experimental and comparison groups, showing significant differences in mean self-care behavior scores and mean quality of life scores at baseline, immediately after the program ended (week 4), and after the program ended (week 12) ($p < 0.001$). Group and time significantly affected self-care behavior and quality of life scores (**Table 3**). Post hoc pairwise comparisons using Bonferroni's method were used to assess differences between groups at each time point (**Table 4**).

Table 3. Comparison of the difference in self-care behavior and quality of life between groups over time and the effect size using a mixed-design repeated measures ANOVA (n = 66)

Source of variation	SS	df	MS	F	p-value	Partial eta squared
Self-care behavior						
Between-subject						
Group	26,647.52	1	26,647.52	296.32	< 0.001	0.822
Error	5,755.33	64	89.93			
Within-subject						
Time	45,062.82	1.33	33,987.88	869.98[a]	< 0 .001	0.931
Time × Group	14,104.75	1.33	10,638.27	272.31[a]	< 0.001	0.810
Error (Time)	3,315.02	84.85	39.07			
Quality of life						
Between-subject						
Group	10,846.92	1	10,846.92	67.41	< 0.001	0.513
Error	10,298.62	64	160.92			
Within-subject						
Time	25,364.03	1.81	14,006.08	203.14[b]	< 0.001	0.760
Time × Group	7,061.10	1.81	3,899.16	56.55[b]	< 0.001	0.469
Error (Time)	7,990.98	115.90	68.95			

Note. [a] = Greenhouse-Geisser (epsilon < 0.75), [b] = Huynh-Feldt (epsilon ≥ 0.75), SS = sum of squares, df = degree of freedom, MS = mean square

Table 4. Post-hoc comparison of mean self-care behavior scores and mean quality of life scores at each time point between groups (n = 66)

Time/Variables	Group		Mean difference*	SE	p-value	95% CI for difference	
						Lower	Upper
Self-care behavior							
Baseline	Experimental	Comparison	-0.576	1.717	0.739	-4.007	2.855
Week 4	Experimental	Comparison	33.253	1.796	< 0.001	29.665	36.840
Week 12	Experimental	Comparison	36.929	1.554	< 0.001	33.825	40.034
Quality of life							
Baseline	Experimental	Comparison	-1.947	1.298	0.139	-4.540	0.646
Week 4	Experimental	Comparison	21.294	2.608	< 0.001	16.083	26.504
Week 12	Experimental	Comparison	25.062	2.972	< 0.001	19.125	31.000

Note. SE = Standard error, CI = Confidence interval, * = Mean difference between the experimental and comparison groups

Effects of the TCS Program on Hospital Readmission

A Chi-square test was used to compare the differences between the groups. The participants in the experimental group (n = 32) showed a significantly lower proportion of hospital readmission within 28 days due to HF exacerbation and all-cause hospital admission than the participants in the comparison group (n = 32), revealing a statistically significant difference ($p < 0.05$), as shown in **Table 5.**

Table 5. Comparison of hospital readmissions within 28 days after discharge between groups using the Chi-square test (n = 64)

Hospital readmission within 28 days	Experimental group (n = 32)		Comparison group (n = 32)		Chi-square test	p-value
	n	%	n	%		
Heart failure-specific cause	2	6.25	10	31.25	5.026	0.025
All-cause hospital readmission	4	12.50	13	40.63	5.126	0.024

Discussion

The TCS program was found to effectively improve self-care behaviors and quality of life, and reduce hospital readmissions. The TCS program focuses on HF care during hospitalization and continuous care post-discharge. The TCS program enhances knowledge and self-care skills through proper education tailored to PW-HF's context, individualized discharge planning, medication explanation, and symptom monitoring training, aiming to prevent HF exacerbations. With effective communication facilitated by the PI's use of the local language and culturally relevant material, a sodium guidebook for northeastern foods helped PW-HF and their caregivers understand. Thus, the TCS program was culturally appropriate. This was congruent with the effective strategy for optimizing transitional care of HF in Australia. Health education dissemination should be provided in the correct language and communication pattern tailored to patients' cultural beliefs, and the educational materials should be tailored to PW-HF backgrounds.[24]

The follow-up care process was an integral part of the program, designed to bridge care gaps during the critical 1-3 months post-discharge period. The TCS program consisted of five follow-up sessions conducted over four weeks via telephone and the LINE application. Participants could also contact the PI for health advice at any time. This approach aligns with the AHA's and ESC's recommendations for minimizing transitional care gaps.[3,12,20] These follow-up activities enabled the assessment of health status, identification of self-care problems and obstacles, and provision of tailored advice to help participants modify their self-care behaviors to suit individual contexts and daily lives. The follow-ups also allowed for monitoring of abnormal symptoms, encouraging continuous self-evaluation and health monitoring. Notably, several experimental group participants contacted the PI for additional advice on managing disease exacerbation and other health issues before their scheduled follow-ups. This demonstrated that the continuity of care provided by the TCS program fostered a greater sense of self-interest in self-care among PW-HF. This ongoing support resulted in significantly higher self-care behavior and quality of life in the experimental group compared to the comparison group, both immediately after the program ended and eight weeks later. This suggests that continuous self-care enables timely management of severe symptoms, builds self-confidence, facilitates individualized advice, and reduces anxiety. This finding

aligned with the experiences of PW-HF in transition care, who reported receiving essential information, benefiting from specialist follow-up, and having direct contact for obstacles, all of which boosted their confidence.[24] It is important to note that caregivers play essential roles in successfully transitioning PW-HF from hospital to home, contributing to better outcomes.[26,39] Consequently, the experimental group experienced fewer hospital readmissions than the comparison group. Ultimately, the collective approaches used to support PW-HF from the hospital through post-discharge were beneficial for improving both their clinical and psychological outcomes. These findings support the validity of Naylor et al.'s transitional care model.[19]

Previous studies consistently support our findings that transitional care interventions improve patient outcomes.[22,25-29] These effective interventions typically feature multiple components, including needs assessment, care coordination, tailored information and support, psychological assistance, self-care knowledge and skill training, ongoing monitoring, and continuity of care. Healthcare professionals must communicate effectively within and across transition care settings. Systematic continuity of care, when combined with telemonitoring methods such as LINE applications, video calls, or traditional methods like phone calls and home visits, has demonstrated improvements in self-care behaviors and reductions in symptom burden or hospital readmissions.[25-29] However, our study's findings regarding quality of life did not align with a prior meta-analysis,[25] which indicated that transitional care interventions did not enhance the quality of life for PW-HF, despite showing reductions in emergency room visits, rehospitalization, and mortality. This discrepancy might be attributed to the meta-analysis's long-term follow-up period (3 years), during which the disease trajectory of PW-HF could have progressed, potentially necessitating increased support and impacting their quality of life. In summary, the TCS program, through its education, patient-centered planning, and continuous follow-up, enabled sustained self-care adherence and early symptom management, ultimately leading to significant improvements in self-care behaviors, reduced hospital readmission, and a higher quality of life for PW-HF.

Limitations

The TCS program demonstrated positive results. However, these should be interpreted with caution due to several potential limitations. First, self-report questionnaires were used to measure self-care behavior and quality of life. This method is susceptible to response bias, even with efforts to blind the data collector. Moreover, while these questionnaires are well-established in Western contexts, their cultural relevance within the Thai population warrants further investigation. Second, the PI personally delivered the TCS program. This could introduce performance bias, given the PI's knowledge of group assignments.[40] Third, participants were recruited from a single tertiary care hospital, which may limit the generalizability of these findings. Future replication studies employing a pragmatic clinical trial design across multiple sites could enhance the external validity and generalizability of the results. Fourth, the TCS program's reliance on the telephone and LINE application for follow-up limits its feasibility for patients without smartphones, potentially creating unequal access across the entire population. Therefore, adjustments in implementation may improve the accessibility of the program. Additionally, the TCS program has a follow-up duration of a short period, so longer studies with follow-ups of six months to one year are needed to determine its sustainability.

Conclusions and Implications for Nursing Practice

The TCS program demonstrated positive outcomes, improving self-care behaviors and quality of life while reducing hospital readmission for PW-HF. This highlights the crucial role of APNs in incorporating

and leading such a TCM program as a key component of care for PW-HF transitioning from hospital to home. With their advanced knowledge and skills in care management, APNs are uniquely positioned to spearhead the implementation and coordination of these essential transitional care initiatives. A key challenge for APNs is adjusting interventions for local contexts without compromising their effectiveness or patient-centeredness, to ensure the integrated care model is tailored to local needs, preferences, and available resources. Further evaluations of other patient outcomes, such as functional ability and hospital outcomes (e.g., cost of care and emergency room visits), may provide a more comprehensive assessment of the program's effectiveness. Future research may explore the development of programs that incorporate e-health technology, digital health, and mobile health. These innovations have the potential to further benefit PW-HF and their families.

Acknowledgments

The authors gratefully acknowledge all study participants and their caregivers for their cooperation and participation.

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Appendix

Table A1. Summary of the TCS program

Schedule	Domain	Activities
Phase I: Hospitalization and Pre-discharge		
Activity 1 (At least 24 hours after achieving clinical stability) 15–20 minutes	• Screening	1. Establishing rapport with PW-HF and their caregivers to foster trust 2. Assess patients' knowledge of heart failure 3. Evaluate their past self-care behaviors, obstacles to self-care, and quality of life 4. Provide opportunities for them to ask additional questions and schedule an appointment for the next activity
Activity 2 (After establishing rapport) 30–40 minutes	• Educating/promoting self-management • Maintaining relationships with patients and caregivers	1. Provide a handbook titled *Living with Heart Failure* and a guidebook on sodium levels in condiments and foods suitable for people in the Northeast region, titled *Sodium: How Much?* for PW-HF and their caregivers 2. Strengthen the patient's self-care skills, such as weighing themselves, controlling fluid intake, assessing edema, and managing early symptoms independently, while distributing self-care daily log 3. Encourage the patient to discuss past challenges or obstacles in self-care and provide additional guidance to help them adopt appropriate self-care behaviors 4. Offer an opportunity for additional questions and schedule an appointment for the next activity
Activity 3 (Pre-discharge) 30 minutes	• Engaging patients and caregivers • Collaborating with patients, caregivers and team • Coordinating care	1. Prepare patients before discharge by reviewing their self-care knowledge, reinforcing self-care skills, and ensuring they properly understand how to use the self-care daily log. This includes detailed discussion sessions to ensure patients and their caregivers feel confident in managing the patient's condition at home. 2. Coordinate with the multidisciplinary team to review the patient's medication 3. Collaborate in analyzing potential self-care challenges or obstacles that may arise when the patient is discharged to plan an individualized discharge plan

Table A1. Summary of the TCS program (Cont.)

Schedule	Domain	Activities
		4. Encourage the patient and their caregiver to actively participate in planning solutions for potential challenges, provide additional appropriate recommendations, and identify resources to support the patient's self-care 5. Schedule follow-up appointments via telephone and the LINE application. The first follow-up takes place within 48 hours after discharge, followed by weekly check-ins. Provide a contact number for patients and caregivers in case of emergencies
Phase 2: Post-discharge Continuous Care		
Activity 4-8 (within 48 hrs, 7th, 14th, 21st, and 28th day post-discharge) 10-15 minutes	• Promoting continuity • Managing symptoms and other risks	1. Conduct follow-up visits with patients via telephone or the LINE application 2. Provide individualized guidance on symptom management and inquire about any problems or obstacles the patient and their caregiver might encounter while managing self-care at home 3. Praise patients for their self-care behavior changes to boost their confidence in continuous self-care 4. At the final telephone follow-up call, express gratitude to the patient and their caregiver

ผลของโปรแกรมสนับสนุนการดูแลระยะเปลี่ยนผ่านสำหรับผู้ป่วยภาวะหัวใจล้มเหลว : การทดลองแบบสุ่มและมีกลุ่มควบคุม

รัชนีกร สุนนนาม อภิญญา ศิริพิทยาคุณกิจ สุนทรี เจียรวิทยกิจ*

บทคัดย่อ: ภาวะหัวใจล้มเหลวเป็นภาวะเรื้อรังที่ส่งผลกระทบต่อสุขภาพ ความผาสุก และคุณภาพชีวิต การมีชีวิตอยู่กับภาวะหัวใจล้มเหลวจำเป็นต้องมีการดูแลตนเองที่สม่ำเสมอและมีประสิทธิภาพ เพื่อป้องกันการกลับมารักษาซ้ำในโรงพยาบาล งานวิจัยที่ศึกษาผลของโปรแกรมการดูแลระยะเปลี่ยนผ่านที่ผสมผสานแนวปฏิบัติจากหลักฐานเชิงประจักษ์มีจำนวนจำกัด และต้องการการตรวจสอบผลของโปรแกรมด้วยวิธีการที่เข้มงวด การทดลองแบบสุ่มที่มีกลุ่มควบคุมมีวัตถุประสงค์เพื่อศึกษาผลของโปรแกรมสนับสนุนการดูแลระยะเปลี่ยนผ่านต่อพฤติกรรมการดูแลตนเอง คุณภาพชีวิต และการกลับมารักษาซ้ำในโรงพยาบาลของผู้ป่วยภาวะหัวใจล้มเหลว ณ โรงพยาบาลตติยภูมิแห่งหนึ่งในภาคตะวันออกเฉียงเหนือของประเทศไทย กลุ่มตัวอย่างจำนวน 66 คน ได้รับการสุ่มเข้ากลุ่มทดลองจำนวน 33 คน และกลุ่มเปรียบเทียบจำนวน 33 คนโดยใช้โปรแกรมคอมพิวเตอร์จัดลำดับการเข้ากลุ่มด้วยการสุ่ม กลุ่มทดลองได้รับโปรแกรมสนับสนุนการดูแลระยะเปลี่ยนผ่านที่พัฒนาโดยผู้วิจัยเป็นระยะเวลา 4 สัปดาห์ร่วมกับการดูแลตามปกติ ขณะที่กลุ่มเปรียบเทียบได้รับเพียงการดูแลตามปกติ เก็บรวบรวมข้อมูล 3 ช่วงเวลาดังนี้ ก่อนเริ่มโปรแกรม หลังสิ้นสุดโปรแกรมทันที (สัปดาห์ที่ 4) และ 8 สัปดาห์หลังสิ้นสุดโปรแกรม (สัปดาห์ที่ 12) โดยใช้แบบบันทึกข้อมูลส่วนบุคคลและข้อมูลด้านสุขภาพ แบบประเมินดัชนีชี้วัดการดูแลตนเองผู้มีภาวะหัวใจล้มเหลว และแบบสอบถามการใช้ชีวิตอยู่กับโรคหัวใจล้มเหลวของมินเนโซตา การวิเคราะห์ข้อมูลดำเนินการโดยใช้สถิติเชิงพรรณนา การวิเคราะห์ความแปรปรวนในการทดลองแบบผสมที่มีการวัดซ้ำ และการทดสอบไคสแควร์

ผลการศึกษาพบว่า กลุ่มทดลองมีพฤติกรรมการดูแลตนเองและคุณภาพชีวิตที่เพิ่มขึ้นเมื่อเทียบกับกลุ่มเปรียบเทียบอย่างมีนัยสำคัญทางสถิติ อีกทั้งกลุ่มทดลองมีจำนวนผู้ป่วยที่กลับมานอนโรงพยาบาลภายใน 28 วันหลังจำหน่ายออกจากโรงพยาบาลต่ำกว่ากลุ่มเปรียบเทียบอย่างมีนัยสำคัญทางสถิติ พยาบาลผู้เชี่ยวชาญมีบทบาทสำคัญในการนำโปรแกรมนี้ไปใช้ในการดูแลผู้ป่วยภาวะหัวใจล้มเหลวระยะเปลี่ยนผ่านจากโรงพยาบาลกลับสู่บ้าน อย่างไรก็ตาม ควรศึกษาเพิ่มเติมในกลุ่มตัวอย่างขนาดใหญ่ขึ้นและในบริบทอื่น ก่อนนำโปรแกรมไปใช้อย่างกว้างขวาง

Pacific Rim Int J Nurs Res 2025; 29(4) 829-847

คำสำคัญ: พยาบาลผู้เชี่ยวชาญ การกลับมารักษาซ้ำในโรงพยาบาล ผู้ป่วยภาวะหัวใจล้มเหลว คุณภาพชีวิต พฤติกรรมการดูแลตนเอง โปรแกรมสนับสนุนการดูแลระยะเปลี่ยนผ่าน

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