

# Outcomes of an Advanced Practice Nurse–Led Continuing Care Program in People with Heart Failure

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**Abstract:** Heart failure is a serious, chronic, and complex condition requiring continuing care. Therefore, advanced practice nurses play a key role to improve the healthcare quality for this population. The purpose of this quasi-experimental study was to compare outcomes of persons with heart failure receiving the Continuing Care Program led by advanced practice nurses and those receiving usual care. Purposive sampling was used to recruit people with heart failure from a university hospital in Thailand. The participants numbered 29 and 42 in the comparison and intervention groups, respectively. The study outcomes included: body weight changes, complications, functional status, quality of life, satisfaction with nursing care, emergency room visits, time interval between discharge and the first readmission, readmission rate, length of stay, and cost of care assessed at hospital discharge and three-months post-discharge. Data were analyzed using descriptive statistics, nonparametric tests, t-test, and regression analysis.

Results revealed that functional status, quality of life, and patient satisfaction with nursing care in the intervention group were significantly higher, whereas length of stay and cost of care were significantly lower than those in the comparison group. Therefore, the Advanced Practice Nurse–Led Continuing Care Program holds promise for improving population-based care outcomes for those with complicated chronic health problems such as heart failure.

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## Introduction

Heart failure (HF) is a major public health problem that leads to morbidity, hospitalization, and mortality in adults and older adults.<sup>1</sup> Hospitalization accounts for the majority of the costs in heart failure care.<sup>2</sup> Total medical costs have been projected to increase from \$20.9 billion in 2012 to \$53.1 billion in 2030.<sup>2</sup> In Thailand, heart failure is one of the major cardiovascular health problems and financial

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burdens.<sup>3</sup> HF is a clinical syndrome where heart is unable to pump sufficient blood to meet the metabolic needs of the body's tissues<sup>3</sup> resulting in clinical symptoms, such as rales, edema, and shortness of breath due to intravascular or interstitial volume overload. Additionally, inadequate tissue perfusion leads to consequent signs of fatigue and poor exercise tolerance.<sup>4</sup> The symptoms of heart failure are often characterized by stages of decline interrupted by the stage of stability,<sup>5</sup> which is difficult to predict and demanding for patients and families to manage because of its complexity. Poor management leads to worsening symptoms, decreased functional status, anxiety and depression, and poor quality of life, and exacerbation leading to more hospital readmission.<sup>6,7,8</sup> Thus, a person with heart failure (PWHF) requires ongoing support in managing the complex interplay between disease severity, treatment strategies and symptom control. There is strong evidence that advanced practice nurses (APNs) can effectively coordinate care with patients and families, physicians, and other health care providers to achieve holistic care and better outcomes.<sup>9</sup>

Evidence of APNs' impact on favorable outcomes has been explored in diverse patients.<sup>10-14</sup> For patients who are chronically ill with a diverse array of health problems, APNs have had a favorable impact through providing continuity of care, and population-based and efficient case management. For PWHF in particular APN care management has reduced unplanned readmissions<sup>14-18</sup> and healthcare costs,<sup>14</sup> and improved time to readmission,<sup>14</sup> self-care scores,<sup>19</sup> and patients' quality of life.<sup>18,19</sup> However, in Thailand, there are few studies about the implementation of continuity of care programs, as well as few studies examining APN outcomes in PWHF. Therefore, the purpose of this study was to compare the outcomes of an Advanced Practice Nurse-Led Continuing Care Program (APN-CCP) in PWHF with those of a comparison group receiving usual care. The outcomes measured included body weight changes, complications, functional status, quality of life, satisfaction with nursing care, emergency room visits, time interval between discharge and the first readmission, readmission rate, length of stay, and cost of care.

## **Literature Review**

The ability of patients with HF to maintain an optimal level of physical and psychological well-being, resulting in reduced morbidity and mortality rate, and lower cost of healthcare services is related to their ability to manage their therapies and symptoms and to work effectively with their health care providers.<sup>20</sup> Effective self-care includes: becoming knowledgeable about the condition, understanding and detecting symptoms in their early stages, taking medications accurately, managing fluid and sodium intake, and balancing physical activity and rest. Also, improving general health behaviors such as stopping smoking and receiving immunizations, managing other comorbidities, and navigating the health care system are critical components of effective self-management.<sup>20</sup> The consequences of poor management or limitations in self-care can lead to poor outcomes. Thus, because of the number of persons affected by HF and the complexity of its management, APN continuity of care management holds strong potential for improving outcomes and health for this critical, and growing population.<sup>21</sup>

The competencies of APNs include activities undertaken as part of delivering advanced nursing care directly to patients. Care management is the core competency that is expected of an APN. An APN has to analyze patients' problems, establish care team and system for monitoring patient care, and manage the nursing care system for a target population. Therefore, APNs' roles suit the performance of care management for PWHF who have complicated problems and need continuity of care. APNs working in population-based care reflect a process of continuity of care because they can follow up their responsible clients across settings, from one unit to another or from hospital to home. In addition, continuity of care through hospitalizations by APNs is usually based on a multidisciplinary collaboration model. The multidisciplinary interventions are those in which management is team based, with a physician plus one or more of the following: a specialist nurse, a pharmacist, a health educator, a dietician, or

a social worker.<sup>22</sup> Findings of previous studies show that they can reduce both hospital admission and mortality rate, improve quality of life, and decrease the economic burden in persons with HF.<sup>22,23</sup> Moreover, previous studies<sup>22</sup> demonstrated the effectiveness of multidisciplinary interventions having a nurse assistant in the management of PWHF. A continuing care program is one of the multidisciplinary interventions used by APNs to improve outcomes. In this present study, a continuing care program led by APNs was designed to manage care for PWHF, and established to bridge the gap of caring between the hospital and home.

Outcomes refer to the result of structure and process factors and a measure of healthcare quality.<sup>24</sup> Outcomes of the APN are explained as the end product of an intervention based on the use of clinical judgment and theoretical, scientific knowledge, skills, and experiences and are the natural consequences of the APN's work, goals, and focus.<sup>9</sup> One way of measuring outcomes of APN care are using the values that APNs put on their areas of practice.<sup>25</sup> Measuring outcomes of APN in this study were the end result of the continuing care program on patient and hospital outcomes. Recently, there has been evidence of the effectiveness of APNs' care on outcomes, for example, health status and improved service outcomes in a variety of studies conducted in Thailand.<sup>26</sup> However, outcomes of the APN-led interventions have not been explored clearly in this population in the country.

The Nursing Role Effectiveness Model (NREM),<sup>27</sup> used as the framework for this study, is based on the structure–process–outcome model of Donabedian.<sup>28</sup> The structure component consists of nurse, patient, and organization variables that affect the processes and outcomes of care. Process refers to nursing interventions synthesized from the competencies of the APNs' role including care management to design a continuing care program led by APNs as the intervention for this study and drove the outcomes. The outcomes refer to patient outcomes and hospital outcomes that are expected to be sensitive to the effects of nursing interventions. Therefore, in this study, the NREM<sup>27</sup> in combination with the role

competencies of APN and with the care management concept were used as a theoretical framework to explore outcomes of the APN–CCP for PWHF by testing the following hypotheses:

PWHF receiving the intervention will have fewer complications, emergency room visits, hospital readmissions, shorter lengths of stay during readmissions, and lower cost of care, but higher negative body weight balance, functional status, quality of life, satisfaction with nursing care, and time interval between discharge and the first readmission than those in the comparison group.

## Methods

**Design:** This study used a quasi–experimental, pretest and posttest design with a comparison group.

**Sample:** The sample consisted of 2 groups: PWHF who received the APN–CCP and PWHF receiving usual care. Criteria for inclusion of the participants were being: 45 years old and older; diagnosed with HF from myocardial infarction with ejection fraction (EF) less than 40% or Killip class III–IV; alert and oriented, reachable by telephone after discharge; and able to speak and understand Thai language. The exclusion criteria were: having severe symptoms or complications from heart or comorbid diseases, death after recruitment into the study, referred or moved to another setting, and not available for follow-up at OPD.

Power analysis revealed that 50 participants were needed for each of the intervention and comparison groups to achieve an effect size of 0.50,<sup>14</sup> an alpha of .05, and a power of .80. Study enrollment included 34 comparison and 46 intervention participants. The data collection in the comparison group was conducted first to prevent contamination of the care since the same inpatient units were used for both phases of the study. Following comparison group data collection, enrollment for the intervention phase began. Target enrollment goals were not achieved because approximately 30–40% of PWHF had such severe symptoms or complications from heart problems that they were unable to participate in the study, or were moved to

other settings, and therefore were not available for follow-up at home. In addition, five participants of the comparison group and four participants of the intervention group died during the study. Thus, the final total sample consisted of 71 participants: 29 in the comparison group and 42 in the intervention group.

The intervention was provided by two APNs who had graduated with a master's degree in nursing, and were certified as APNs by the Thailand Nursing and Midwifery Council (TNMC); worked full-time as population-based APNs across units; provided special care for a group of PWHF; and were willing to participate in the study. They implemented the intervention as part of their usual care duties.

**Setting:** This study was conducted at a medical nursing department of a 2000-bed university hospital in northern Thailand. This facility provided both routine and specialized care services to critically and/or chronically ill with a wide range of diseases and conditions that required hospitalization and advanced treatments. Participants were drawn from two coronary care units, one male medical care unit, and one female medical care unit because PWHF were predominantly admitted to these units. Care for PWHF in these units was provided by physician specialists, residents, nurses, and other health care providers who adhered to standard practices of care in the hospital.

**Ethical Considerations:** This study was approved by the Research Ethics Committee of the Faculty of Medicine, Chiang Mai University (NONE-2557-02387). All potential participants were informed about: the purpose of the study; what participation in the study involved; confidentiality and anonymity issues; and, the right to withdraw without repercussions. All participants were asked to sign a consent form prior to inclusion.

***Intervention: Advanced Practice Nurse-Led Continuing Care Program (APN-CCP)***

The APN-CCP focused on coordinating and facilitating continuous care from hospital to home. Components of the APN-CCP included assessment and problem identification; collaborative care and discharge plan development and implementation;

care coordination from hospital to home, and continuous monitoring and evaluation across the follow-up period.<sup>19</sup> During hospitalization, the APNs visited the patients within 24 hours of admission to assess their symptoms and health problems, transition care needs, expectations of the hospital experience and began development of the plan of care. The goals of care were developed in collaboration with the PWHF, caregivers, physicians, nurses, and other healthcare team members. PWHF and caregivers were encouraged to participate in goal setting. Daily visits continued throughout the hospitalization. The focus of these 30–60 minute visits included patient and caregiver education about heart failure, symptoms, treatment and medications, dietary recommendations, symptom reporting and management and activity and exercise progression. APNs began the process of skills training to prepare patients and caregiver for the transition to home. A patient's specific symptoms, treatment plan and individualized self-management plan guided the discussions, with a particular focus on issues that are likely to arise during the early discharge period. The APNs collaborated with the healthcare team by having informal and formal meetings, attending team conferences, attending patient rounds with physicians and/or making phone calls to related healthcare providers. The collaboration with the nurses, physicians, and other healthcare providers was done to design a patient specific plan, coordinate its implementation, support the efforts of nurses and other providers and maintain communication with all team members regarding the patient's progress in meeting discharge goals.

Within 24 hours before discharge, the APNs visited the patient and related healthcare team members to finalize discharge preparations. Specific information related to signs and symptoms of HF, medication, diet, resources in community including the telephone number for counseling, were given to the PWHF and their caregivers. Follow-up appointments for outpatient department (OPD) visits 2 weeks after discharge were made and confirmed with the PWHF. The discharge plan included a map to PWHF's residences, the precise address, and PWHF's telephone numbers.

After discharge, the APNs were available to the PWHF and their caregivers by telephone from 8 a.m. to 8 p.m., Monday through Friday, and 8 a.m. to noon on weekends. The APNs visited each patient at OPD on the day of 2 weeks–follow up where the APN assessed competencies of PWHF and family in self-care having been home for 2 weeks and reinforced information and skills. The caregivers' ability to supplement the PWHF's self-care efforts as well as any concerns about the environment at home were assessed. PWHF were encouraged to maintain their functional ability. Caregivers were also encouraged to ask questions and learn about strategies to support the PWHF. Moreover, social and community resources availability were assessed and assistance for accessing community resources was provided.

**Usual care:** This consisted of routine care activities provided for PWHF by nurses and physicians following standard of care in place at the agency at the time of the study. Staff nurses provided functional nursing care in the hospital, a method of providing patient care by which nurses perform specific tasks for a large group of patients, and take care of patients at their units only, namely unit–based care. On the day of discharge, they provided discharge planning for PWHF at their units as well. However, their care includes only unit–based activities and excludes care in OPD or telephone follow–up post discharge.

PWHF received HF medical management consistent with current Thai medical practices related to HF treatments. The medical plan of care did not differ between groups, except that physicians responding to the APNs assessment of the intervention patient needs and symptoms.

**Instruments:** Data were obtained through four questionnaires: *Personal Information Record Form (PIRF)*; *Outcomes Record Form (ORF)*; *Minnesota Living with Heart Failure Questionnaire (MLHF-Q)*; and *Satisfaction with Nursing Care Questionnaire (SNCQ)*.

The *PIRF*, developed by the primary investigator (PI), was used to obtain the participants' demographic data of age, gender, marital status, religion, comorbidities, heart failure related complications, treatment regimen,

history of illness, medications ordered, and laboratory results.

The PI–developed *ORF* for gathering data related to outcomes variables consisted of body weight changes, functional status, complications (i.e., pulmonary edema, renal failure, cardiac arrhythmia, and skin break down), emergency room visits, time interval between discharge and the first readmission, readmission rate, length of stay, and cost of care. Functional status was referred to an individual's ability that carries out activities of daily living and participates in life situations and society. It was measured by the New York Heart Association Classification developed by the Criteria Committee of the New York Heart Association.<sup>29</sup> The PWHF are classified into one to four categories: Class I = no symptoms and no limitation during ordinary physical activity; Class II = mild symptoms and slight limitations during ordinary physical activity; Class III = marked limitation during physical activity; Class IV = unable to carry out any physical activities without discomfort. A lower of the classification indicates greater in functional status. Regarding complications, the number of patients who did or did not develop pulmonary edema, renal failure, cardiac arrhythmia, skin break down, and/or others during the study period only was counted. Resource use included counting per patient emergency room visits, hospital readmissions, and the time interval between discharge and the first readmission, as well as length of stay for subsequent readmissions. Cost of care was defined as the money that PWHF spent for care services related to the investigation and treatments including laboratory tests, procedures, therapies, medications, healthcare service fees, and medical facilities. The data were collected from the database management system of setting.

The *MLHF-Q* developed by Rector et al.,<sup>30</sup> was used to assess the participants' perception of the effects of heart failure on the physical, socioeconomic, and psychological aspects of their lives. The participants responded to 21 items using a six–point Likert scale, ranging from 0 to 5 as follows: 0 = no; 1 = very little; 2 = little; 3 = moderate; 4 = much; and 5 = very much. The possible summary score ranges from 0 to 105; a



lower score reflects higher quality of life. It was translated to Thai by two bilingual experts in content accuracy of the Thai version of the MLHF-Q study.<sup>31</sup> Moreover, the psychometric properties of the Thai version of the MLHFQ were tested by Tangsatitkai and Sakthong.<sup>32</sup> The results showed that Cronbach's alpha were .86 to .93. An item example is "Did your heart failure prevent you from living as you wanted during the past month (4 weeks) by making you short of breath?" In this study, this instrument was tested with 15 PWHF and its Cronbach's alpha coefficient was .84 and in this main study was .81.

The *SNCQ*, a 15-item self-rating questionnaire developed by Suwisith and Hanucharunkul<sup>33</sup> was used to evaluate patients' satisfaction with nursing care. The participants were asked to rate their satisfaction with care provided by the APN (for the intervention group) or registered nurses (for the comparison group) on a 5-point Likert scale, ranging from 1 to 5 as follows: 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; and 5 = strongly agree. All items were positive questions. The total score was calculated by summing score on each of the 15 items. The total score was 75 points; a higher score indicates higher satisfaction with care. An item example is "The nurse could solve your problems." Reliability analysis was performed on the questionnaire with Cronbach alpha coefficient for pre-test with 15 PWHF being .90 and for this study was .89.

**Procedure:** Data collection was conducted from September 2014 to May 2016. PWHF were recruited by purposive sampling. The data collection in the comparison group was conducted first to prevent contamination of the care. The PI reviewed patients' medical records to identify those who met the inclusion criteria for the comparison group. Demographic data and history of illness were recorded from the medical records and the interview was conducted at the time of enrollment. Functional status, patient satisfaction, and quality of life were assessed. The comparison group received treatment and usual nursing care as following the standard of care for PWHF and discharge planning by two master-prepared nurses. Within 24

hours before discharge, patient outcomes for posttest Time 2 and hospital outcome (length of stay) were assessed by a research assistant. Then, three months after discharge, all study outcomes of PWHF and emergency room visits, time interval between discharge and the first readmission, readmission rate, and cost of care were assessed.

Once data collection in the comparison group was finished (after posttest Time 2), the intervention group was recruited and that phase of the study began. The APN-CCP intervention group's baseline data were collected within 24 hours of hospitalization and continued as described above. All outcomes of the participants in the intervention and comparison groups were measured on the day of discharge and three months after discharge.

**Data Analysis:** Descriptive statistics were used to analyze the participants' demographics. Chi-square, Fisher's exact, and t-test were used to compare differences between the intervention and comparison groups. The outcome variables were analyzed using regression analysis with the Stata statistical software.

## Results

The participants' ages ranged from 44 to 89 years. The mean age in the intervention group and the comparison group were 66.30 years (SD = 11.18) and 67.65 (SD = 9.93), respectively. Most participants in both groups were male, married, Buddhist, and had ST elevation myocardial infarction. Additionally, they had an ejection fraction lower than 50% and had co-morbidities before admission but had no heart failure related complications. No statistically significant differences were found between the intervention and comparison groups regarding age, gender, marital status, religion, ejection fraction, co-morbidity, and heart failure-related complications.

For testing the difference of outcomes between two groups, Gaussian regression analysis was used to evaluate the effectiveness of intervention to body weight changes and patients' satisfaction with nursing care. There were no statistically significant differences

between the two groups in body weight changes on the day of discharge and at 3 months after discharge, whereas the score of patients' satisfaction with nursing

care in the intervention group was significantly higher than that in the comparison group at 3 months after discharge (Table 1).

**Table 1** Effectiveness of Intervention on Patients' Body Weight Changes and Satisfaction with Nursing

Variables	Coef.	SE	t	95% CI	p-value
Body weight changes					
At discharge					
Intervention group	−0.02	0.79	−0.03	−1.60 to 1.56	.980
Gender*	1.31	0.84	1.57	−0.35 to 2.98	.121
Type of MI*	−3.42	1.20	−2.86	−5.82 to −1.03	.006
Ejection Fraction*	0.02	0.03	0.82	−0.04 to 0.09	.417
Age*	−0.02	0.04	−0.48	−0.10 to 0.06	.630
Constant	−2.28	3.24	−0.70	−8.76 to 4.19	.484
3 months after discharge					
Intervention group	−0.13	0.94	−0.14	−2.01 to 1.75	.891
Gender*	−1.88	0.96	−1.94	−3.81 to 0.05	.056
Type of MI*	−3.24	1.43	−2.27	−6.09 to −0.38	.027
Ejection Fraction*	0.06	0.04	1.57	−0.02 to 0.14	.120
Age*	−0.01	0.05	−0.08	−0.09 to 0.09	.936
Constant	−3.36	3.79	−0.89	−10.92 to 4.22	.379
Patients' satisfaction with nursing care					
At discharge					
Intervention group	3.40	1.84	1.85	−0.27 to 7.06	.069
Satisfaction time 1**	0.55	0.12	4.31	0.30 to 0.81	.000
Gender**	1.70	1.82	0.93	−1.93 to 5.33	.354
Type of MI**	0.04	2.64	0.02	−5.23 to 5.32	.986
Ejection Fraction**	0.02	0.08	0.30	−0.13 to 0.17	.768
Age**	−0.05	0.08	−0.57	−0.22 to 0.12	.567
Constant	31.39	10.74	2.92	9.95 to 52.83	.005
3 months after discharge					
Intervention group	4.56	1.27	3.58	2.01 to 7.09	.001
Satisfaction time 1**	0.28	0.09	2.82	0.08 to 0.47	.006
Gender**	−0.40	1.22	−0.33	−2.83 to 2.02	.743
Type of MI**	−1.80	1.86	−0.97	−5.53 to 1.92	.337
Ejection Fraction**	0.04	0.05	0.72	−0.06 to 0.14	.471
Age**	0.09	0.06	1.52	−0.02 to 0.21	.134
Constant	41.99	8.30	5.06	25.41 to 58.58	.000

\* Effectiveness of intervention was adjusted by age, gender, EF, and type of MI.

\*\* Effectiveness of intervention was adjusted by satisfaction Time 1, age, gender, EF, and type of MI.

The results of logistic regression showed that there were no statistically significant differences in complications, emergency room visits, and readmission rate between 2 groups. However, functional status in the intervention group at 3 months after discharge was significantly lower than that in the comparison group,

indicating better functional ability (Table 2). Multilevel analysis techniques were used to evaluate the effectiveness of intervention on quality of life (QOL). It was found that QOL in the intervention group was significantly better than that in the comparison group on the day of discharge and at 3 months after discharge (Table 3).

**Table 2** Effectiveness of Intervention on Complications, Functional status, Emergency Room Visits, and Readmission Rate

Variables	OR	SE	z	95% CI	p-value
<b>Complications</b>					
At discharge					
Intervention group	0.51	0.22	-1.53	0.21 to 1.21	.127
Age*	0.99	0.02	-0.28	0.94 to 1.04	.782
Gender*	1.17	0.53	0.35	0.48 to 2.85	.727
Ejection Fraction*	1.01	0.02	0.30	0.96 to 1.04	.765
Type of MI*	5.19	3.41	2.50	1.42 to 18.84	.012
Constant	48.34	170.16	1.10	0.04 to 47893.46	.270
3 months after discharge					
Intervention group	0.45	0.21	-1.74	0.18 to 1.11	.081
Age*	0.97	0.02	-1.08	0.93 to 1.02	.281
Gender*	1.46	0.70	0.78	0.56 to 3.74	.433
Ejection Fraction*	1.00	0.02	-0.01	0.96 to 1.04	.996
Type of MI*	2.10	1.44	1.08	0.54 to 8.06	.279
Constant	173.25	630.92	1.42	0.14 to 217982.60	.157
<b>Functional status</b>					
At discharge					
Intervention group	0.54	0.19	-1.74	0.27 to 1.08	.082
Age*	1.00	0.02	0.05	0.96 to 1.04	.957
Gender*	1.68	0.61	1.42	0.82 to 3.43	.155
Ejection Fraction*	1.02	0.02	1.47	0.99 to 1.05	.141
Type of MI*	1.66	0.84	0.99	0.61 to 4.47	.320
3 months after discharge					
Intervention group	0.36	0.14	-2.68	0.17 to 0.76	.007
Age*	1.01	0.02	0.42	0.97 to 1.04	.673
Gender*	2.08	0.80	1.92	0.98 to 4.42	.055
Ejection Fraction*	1.01	0.02	0.70	0.98 to 1.04	.486
Type of MI*	0.19	0.64	0.37	0.42 to 3.46	.709
<b>Emergency room visits</b>					
Intervention group	0.29	0.20	-1.78	0.08 to 1.13	.075
Age*	0.96	0.03	-1.29	0.90 to 1.02	.196
Gender*	2.52	1.86	1.25	0.60 to 10.72	.212
Ejection Fraction*	0.90	0.03	-2.77	0.84 to 0.96	.006
Type of MI*	1.78	1.75	0.59	0.26 to 12.26	.558
Constant	296.98	863.02	1.96	0.99 to 88357.14	.050



**Table 2** Effectiveness of Intervention on Complications, Functional status, Emergency Room Visits, and Readmission Rate (Cont.)

Variables	OR	SE	z	95% CI	p-value
Readmission rate					
Intervention group	0.21	0.16	-1.95	0.04 to 1.01	.051
Age*	0.95	0.03	-1.32	0.88 to 1.02	.188
Gender*	2.22	1.88	0.94	0.42 to 11.66	.345
Ejection Fraction*	0.92	0.04	-2.09	0.85 to 0.99	.036
Type of MI*	1.37	1.72	0.25	0.12 to 16.02	.800
Constant	144.22	453.41	1.58	0.30 to 68387.25	.114

\* Effectiveness of intervention was adjusted by age, gender, EF, and type of MI.

**Table 3** Effectiveness of Intervention on Quality of Life

Quality of life	Coef.	SE	Z	95% CI	p-value
At discharge					
Intervention group	-6.38	2.87	-2.22	-12.00 to -0.74	.026
Gender*	6.09	3.03	2.01	0.15 to 12.03	.044
Type of MI*	6.66	4.31	1.54	-1.80 to 15.11	.123
Ejection Fraction*	-0.16	0.12	-1.32	-0.40 to 0.08	.186
Age*	-0.02	0.14	-0.16	-0.31 to 0.26	.870
Constant	41.44	11.61	3.57	18.69 to 64.18	.000
3 months after discharge					
Intervention group	-8.94	2.81	-3.18	-14.45 to -3.43	.001
Gender*	8.36	2.92	2.86	2.62 to 14.10	.004
Type of MI*	7.20	4.24	1.70	-1.11 to 15.50	.089
Ejection Fraction*	-0.26	0.12	-2.24	-0.50 to -0.03	.025
Age*	-0.05	0.14	-0.37	-0.33 to 0.22	.711
Constant	45.12	11.28	4.00	23.00 to 67.24	.000

\* Effectiveness of intervention was adjusted by age, gender, EF, and type of MI.

The effectiveness of the intervention on the time interval between discharge and the first readmission, length of stay, and cost of care was evaluated by Poisson regression. The result showed that the length of stay, and cost of care in the intervention group were

significantly lower than those in the comparison group. However, the time interval between discharge and the first readmission of both groups were non-significantly different between 2 groups (Table 4).

**Table 4** Effectiveness of Intervention to Time Interval between Discharge and the First Readmission, Length of Stay and Cost of Care

Variables	Coef.	SE	Z	95% CI	p-value
Time interval between discharge and the first readmission					
Intervention group	2.17	3.22	0.67	-4.16 to 8.50	.502
Age*	0.92	0.13	6.89	0.66 to 1.18	.000

**Table 4** Effectiveness of Intervention to Time Interval between Discharge and the First Readmission, Length of Stay and Cost of Care (Cont.)

Variables	Coef.	SE	Z	95% CI	p-value
Gender*	-15.12	3.66	-4.13	-22.29 to -7.95	.000
Ejection Fraction*	-0.08	0.14	-0.55	-0.36 to 0.21	.584
Type of MI*	40.90	10.02	4.08	21.26 to 60.54	.000
Constant	-17.68	10.84	-1.63	-38.95 to 3.58	.103
Length of stay					
Intervention group	-2.20	0.66	-3.34	-3.49 to -0.91	.001
Age*	0.11	0.03	3.35	0.04 to 0.18	.001
Gender*	-1.99	0.68	-2.93	-3.32 to -0.66	.003
Ejection Fraction*	-0.06	0.03	-2.50	-0.11 to -0.01	.012
Type of MI*	5.26	1.24	4.21	2.80 to 7.70	.000
Constant	5.25	2.48	2.11	0.38 to 10.13	.035
Cost of care					
Intervention group	-24608.32	105.84	-232.50	-24815.77 to -24400.87	.000
Age*	-364.48	5.71	-63.77	-375.68 to -353.28	.000
Gender*	-47926.83	114.42	-418.83	-48151.11 to -47702.56	.000
Ejection Fraction*	-1123.13	4.23	-265.32	-1131.43 to -1114.84	.000
Type of MI*	28916.70	161.12	179.47	28600.91 to 29232.50	.000
Constant	320325.40	433.46	738.98	319475.90 to 321175.00	.000

\* Effectiveness of intervention was adjusted by age, gender, EF, and type of MI.

## Discussion

Results provided support for the effectiveness of the APN-CCP for PWHF. Statistically significant differences in functional status, patients' satisfaction with nursing care, QOL, length of stay, and cost of care were found between the patients who received the APN-CCP compared with those receiving usual care. This indicates that APN competencies related to improving patients' ability to manage complexity may have had a positive effect. However, no significant differences of body weight changes, complications, emergency room visits, readmission rate, and time interval between discharge and the first readmission were found between two groups.

The results of positive outcomes might be explained that, according to the APN-CCP protocol, APN care focused on comprehensive assessment, team collaboration and care plan development, patient and family education and skill building during inpatient

visit. Thus, the APN was able to assess patients' anxiety related to self-care and their health status and provide support and specific strategies to manage their care more effectively. Building a relationship during the most intense inpatient phase may have enabled patients and families to trust the APN and be more likely to reach out by telephone after discharge. During the OPD visit two weeks after discharge, APNs assessed competencies of the participants in self-care at home and strengthened their knowledge and skills at a time when they had had some experiences with implementing the post discharge plan. As a result, positive findings may be related to a combination of knowledge gained plus reassurance and confidence building for the intervention group. It is possible that this support increased patients' competence and confidence in engaging in physical activities/exercise that led to improved functional ability. This is consistent with a previous study<sup>34</sup> which revealed that continuing care interventions involved by multi-disciplined professionals or

professional nurses included education, instruction, counseling, and telephone contact could improve patients' activities.

Potentially related to the APN–CCP's success in improving functional status may be the finding that QOL improved as well. It could be explained that this program consisting of continuing education, reviewing of knowledge and skills, and reinforcing patient education from inpatient to outpatient could improve knowledge symptom detection, symptom management skills and thereby facilitating control of heart failure symptoms. The participants in the intervention group reported lower heart failure symptom severity associated with effective self–care and resumption of exercise. This finding was consistent with that of Koukoui and colleagues<sup>35</sup> who noted that the impact of physical exercise on improved functional ability and QOL over 6 months of measurement. Hence the combination of improved exercise capacity, functional status, and symptom management contributed to an overall improvement in QOL compared to what was experienced by PWHF receiving usual care.

Regarding the hospital outcomes, the length of stay and cost of care in the intervention group were lower than those in the comparison group. This may be related to the role that the APNs played in detecting early signs of problems, and collaboratively, with physicians, implementing strategies to prevent the onset of symptoms or to minimize their effects during the inpatient phase. During the intense inpatient phase, APNs' regular assessment of participants' health status, laboratory results, persistent or emerging symptoms coupled with prompt consultation with cardiologists and other physicians may have resulted in more timely detection and management as well as prevention of symptoms and complications. They formed constructive relationships with the staff nurses who provided 24 hour care, educated them, and guided them in specific patient focused nursing care, possibly preventing adverse events such as late detection of symptoms. This improved vigilance could have supported overall

achievement of the plan of care and contributed to shorter hospital stays. The shorter length of stay in the intervention group was likely responsible for the decreased cost of care. This result is consistent with a study of Rauh and colleagues<sup>36</sup> which presented that the program implemented by a multidisciplinary team consisting of a cardiologist director, a clinical nurse specialist, registered nurses, and a patient care technician could reduce length of stay and cost of care. Similarly, Naylor and colleagues<sup>14</sup> found that a comprehensive transitional care intervention for PWHF could decrease healthcare cost.

Stronger patient satisfaction scores in the intervention group may be related to two factors noted in the patient interviews: APNs' response to their needs, and APNs as consultants for problem solving. Patients reported that the APNs were expert in teaching, coaching, and problem solving, thus empowering patients to learn self–care skills and to build their confidence in taking care of themselves. This finding is similar to a previous study reporting that continuity of care the providing information about patients' conditions, medications, activities, and available community services coupled with promotion of patient self–care, and feelings of confident preparedness to manage care after hospitalization, were significantly correlated to higher satisfaction with care by the patients.<sup>37</sup>

Some study measures failed to identify significant differences between the groups. The lack of APN–CCP effect on body weight changes, complications, emergency room visits, readmission rate, and time interval between discharge and the first readmission between the intervention group and comparison group may be related to how well the intervention could target the complexity of these specific patients' needs. There are three possible reasons for the lack of significant findings. Firstly, all participants were recruited from the CCU following an acute myocardial infarction with HF as a complication. Therefore, participants in this sample represented a more acutely ill patient

population than was seen in other similar APN care coordination studies.<sup>14,38</sup> Had a broader spectrum of PWHF been included in the sample, such as those admitted to general care units for an exacerbation of chronic heart failure due to multiple causes, their acuity levels may have been more varied.

Secondly, body weight change may not have been a universally important indicator of HF improvement. Depending on the type of HF, for example predominantly pulmonary congestion in acute HF with less total body fluid overload, fluid redistribution rather than by fluid accumulation may be the dominant factor.<sup>39</sup> Measures of symptom severity that are more sensitive to the range of HF symptoms may have shown differences.

Also, participants in the comparison and interventions groups received standard treatment and nursing care of following a care map for heart failure, indicating that all patients received comparable medical and general nursing care, possibly explaining the lack of group differences in complication rates. Lack of difference in acute care resource use (emergency department visits, rehospitalization timing and rates) may be related to the “dose” or intensity of the APN intervention. The APN-CCP focused on preparing patients for self-management but did not include home visits. Other studies revealed that an APN intervention for complex PWHF that involved hospital care coupled with an average of 2 months of home visit follow up was effective in both preventing readmissions and delaying the time to readmission as well as decreasing overall healthcare costs in the intervention group.<sup>15,36</sup> Naylor and colleagues found that the Transitional Care Model (TCM), a program similar to the current study (intense hospital phase) but including one month of APN home visits in addition to telephone availability, resulted in delayed and decreased rehospitalization and cost savings for a variety of high risk elders but was not as effective for PWHF.<sup>40</sup> When the program was modified to extend the intervention up to 2 months on average (1–3 months) with more focused attention to HF management specifically, reduction

in acute usage and some functional outcomes.<sup>14</sup> It is possible that for these highly complex persons with HF, the “dose” of APN care should include direct care in the home to detect and manage worsening symptoms, prepare patients and families to manage the high levels of complexity, and develop sustained self-management skills. Similar to the current study, the TCM included APN OPD visits but ensured that the patient, physician and APN discussed the patient’s progress, goals and problems together during that visit. This continued APN-physician collaboration with strong focus on patient goals seemed to be a key factor in preventing acute care usage, for example, prompt revision of the treatment plan based on the APN’s assessment of symptoms and problems encountered post-discharge. Therefore, the effectiveness of the APN in connecting patients to community resources and actually managing their care in the home could not be shown clearly in this study.

In conclusion, the findings suggest partial effectiveness of the APN-CCP for PWHF. Processes of care contributing to the favorable outcomes were conceptualized from the Nursing Role Effectiveness Model of Irvine and colleagues<sup>27</sup> in combination with the role competencies of APN including holistic and continuity of care. Moreover, APNs in this study worked full time, functioning in advanced practice nursing in population-based care. This could be a significant reason to explain favorable outcomes.

## **Limitations**

Firstly, the intervention was conducted at only one university hospital in northern Thailand, which may not be representative of PWHF in other settings. Another limitation may be that the actual sample size was less than the purposed and had high attrition, mainly due to mortality. Recruiting patients with a wider range of HF severity, from general care units as well as CCUs, would improve both the generalizability of findings as well as supported achievement of the targeted sample size, affecting the study’s power to find significance.

## Conclusions and Recommendations

The results in this study point out that APNs using the Nursing Role Effectiveness Model<sup>26</sup> and working as the population-based care can contribute to the improved outcomes of patients in the intervention group. Therefore, future research is needed to determine how the competencies of APN care can be leveraged to enhance patient outcomes in diverse settings and care environments. It is also recommended that the APN-CCP include home visit after discharge, which incorporates various roles of APNs, care service networks, and care management to demonstrate the effectiveness of the program on outcomes more clearly.

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## ผลลัพธ์ของโปรแกรมการดูแลอย่างต่อเนื่องโดยพยาบาลผู้ปฏิบัติการพยาบาล ขั้นสูงในผู้ป่วยภาวะหัวใจล้มเหลว

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**บทคัดย่อ:** ภาวะหัวใจล้มเหลวเป็นภาวะการเจ็บป่วยที่รุนแรง เรื้อรังและมีความซับซ้อนซึ่งต้องการการดูแลอย่างต่อเนื่อง พยาบาลผู้ปฏิบัติการพยาบาลขั้นสูงมีบทบาทสำคัญในการพัฒนาคุณภาพการดูแลผู้ป่วยกลุ่มนี้ การศึกษาทั้งทดลองนี้มีวัตถุประสงค์เพื่อเปรียบเทียบผลลัพธ์ระหว่างผู้ป่วยภาวะหัวใจล้มเหลวที่ได้รับโปรแกรมการดูแลอย่างต่อเนื่องโดยพยาบาลผู้ปฏิบัติการพยาบาลขั้นสูง และผู้ป่วยภาวะหัวใจล้มเหลวที่ได้รับการพยาบาลตามปกติ กลุ่มตัวอย่างเป็นผู้ป่วยภาวะหัวใจล้มเหลวที่เข้ารับการรักษา ณ โรงพยาบาลมหาวิทยาลัยแห่งหนึ่งของประเทศไทย ถูกคัดเลือกแบบเฉพาะเจาะจง โดยแบ่งเป็นกลุ่มเปรียบเทียบ 29 คนและกลุ่มที่ได้รับโปรแกรมการดูแลอย่างต่อเนื่องจำนวน 42 คนตามลำดับ ผลลัพธ์ที่ศึกษาได้แก่ การเปลี่ยนแปลงของน้ำหนักตัว ภาวะแทรกซ้อน ความสามารถในการทำหน้าที่ คุณภาพชีวิตและความพึงพอใจต่อการพยาบาล การใช้บริการที่ห้องฉุกเฉินหลังจำหน่าย การกลับเข้าพักรักษาตัวในโรงพยาบาลภายใน 28 วันหลังจำหน่าย ระยะเวลาหลังจำหน่ายจนถึงวันที่มีการกลับเข้าพักรักษาตัวในโรงพยาบาล จำนวนวันนอนโรงพยาบาล และค่าใช้จ่ายในการรักษาพยาบาล ซึ่งจะทำการศึกษาเปรียบเทียบ ผลลัพธ์ ณ วันจำหน่าย และสามเดือนหลังจำหน่าย วิเคราะห์ข้อมูลด้วยสถิติเชิงพรรณนา การทดสอบแบบนอนพารามตริก การทดสอบที่ สถิติการวิเคราะห์ถดถอย (regression analysis)

ผลการศึกษาพบว่าความสามารถในการทำหน้าที่ คุณภาพชีวิต และความพึงพอใจต่อการพยาบาลของผู้ป่วยที่ได้รับโปรแกรมการดูแลอย่างต่อเนื่องสูงกว่าผู้ป่วยที่ได้รับการพยาบาลตามปกติอย่างมีนัยสำคัญทางสถิติ ในขณะที่จำนวนวันนอนโรงพยาบาล และค่าใช้จ่ายในการรักษาพยาบาลของผู้ป่วยได้รับโปรแกรมการดูแลอย่างต่อเนื่องต่ำกว่าผู้ป่วยที่ได้รับการพยาบาลตามปกติอย่างมีนัยสำคัญทางสถิติ ดังนั้น การศึกษานี้ชี้ให้เห็นว่าโปรแกรมการดูแลอย่างต่อเนื่องโดยพยาบาลผู้ปฏิบัติการพยาบาลขั้นสูงที่มีลักษณะการทำงานที่ยึดกลุ่มประชากรเป้าหมายเป็นหลักสามารถทำให้เกิดผลลัพธ์ที่พึงประสงค์สำหรับผู้ป่วยที่มีภาวะโรคเรื้อรังซับซ้อนดังเช่นภาวะหัวใจล้มเหลวนี้ได้

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