RESEARCH ARTICLES

Association between community-based nurse practitioner support, self-care behaviour and quality of life in patients with chronic heart failure

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ABSTRACT

Objective: To evaluate the effects of a community-based chronic heart failure management program, delivered by nurse practitioners, on self-care behaviour, quality of life and hospital readmissions.

Background: Chronic heart failure is a complex condition associated with high rates of hospital readmissions. However, many hospitalisations in patients with chronic heart failure are potentially preventable with better self-management and access to specialised healthcare support. Nurse practitioners have an advanced scope of practice, making them well credentialed to support patients with chronic heart failure.

Study design and methods: This study compared self-care behaviour and quality of life in patients who had attended a nurse-practitioner led chronic heart failure management service (SmartHeart) (n=58) compared with patients receiving usual care (n=58), but no nurse practitioner support. Self-care behaviour was assessed using the Self Care Heart Failure Index and quality of life was assessed using the Short Form-36 and Minnesota Living with Heart Failure Questionnaire. Hospitalisation records were extracted from medical records using data-linkage.

Results: Patients who received nurse-practitioner support had better self-care behaviour ($p<0.05$), mental component summary of the Short Form-36 ($p<0.05$) and heart failure specific quality of life ($p<0.05$). All-cause hospitalisations were delayed ($p<0.05$) and length of stay was shorter ($p<0.05$) in the group receiving nurse practitioner support, but there were no differences in chronic heart failure related admissions.

Discussion: A chronic heart failure support program, operating in a community setting and delivered by nurse practitioners, enhanced self-care, improved psychosocial health and reduced time in hospital.

Conclusion: Chronic heart failure management delivered by nurse practitioners can improve self-care behaviour and quality of life, and reduced hospital admissions, compared with usual care.

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Keywords: Chronic heart failure, self-care, quality of life, nurse practitioner, hospital readmissions.

What is already known about the topic?

- Chronic heart failure is a complex health issue requiring disease-specific management that needs to be tailored to the individual. However, many patients with chronic heart failure don't receive adequate support to manage their condition.

What does this paper add:

- A chronic heart failure management service, delivered in primary care by nurse practitioners, improved self-management and quality of life and was associated with a lower rate of hospitalisations compared with usual care alone.

OBJECTIVE

The aim of this study was to evaluate the effects of a community-based chronic heart failure (CHF) management program, delivered by nurse practitioners, on self-care behaviour, quality of life and hospitalisation outcomes derived from linked hospital morbidity data.

BACKGROUND

Chronic heart failure (CHF) is a major public health burden, affecting 2–3% of the population with prevalence rising steeply to over 20% in people aged over 65 years.[1] Episodic exacerbations and rehospitalisation are common in patients living with CHF and contribute significantly to the high healthcare costs associated with the disease.[2] However, many readmissions are considered preventable with better self-management such as following sodium and fluid restrictions, adhering to evidence-based medication, undertaking regular exercise, and knowing when to seek medical support in the event of changes in clinical status.[3, 4]

Co-morbidities are also common in patients with CHF, and these often complicate care and increase the risk of adverse events, especially in older patients.[5] For example, the high incidence of concomitant conditions including frailty,[6] type 2 diabetes, renal dysfunction, anaemia, cognitive deterioration, and depression can all make the management of patients with CHF particularly challenging and contribute to the high rates of hospitalisation.[6, 7]

Many patients with CHF are managed in a primary care setting and may lack a structured system of care to help manage their condition, including effective self-management.[8] Accordingly, there is a need to design and evaluate strategies, with patient education at the core, to improve self-management behaviour of patients with CHF that targets both CHF and other co-morbid conditions, an approach that has been shown in various settings to improve clinical outcomes.[7] Patient self-management in community-based disease management programs that monitor patients at regular intervals shows promise in delaying disease progression and improving quality of life for patients with CHF. [9]

Even though self-management is a patient action, it is most effective when implemented with support and education from healthcare professionals.[10] Nurse practitioners are qualified registered nurses who have been trained and completed postgraduate qualifications in clinical practice in a selected specialisation. They are credentialed through registration with the Nursing and Midwifery Board of Australia to apply an advanced scope of practice, including diagnosing and treating a wide range of health conditions; designing and implementing therapeutic regimens; initiating referral to other health professionals; ordering and interpreting pathology and radiology tests; prescribing and reviewing medications.[11] Nurse practitioners can play an important role in educating and supporting patients in performing self-care[12] and have prescriptive privileges in Australia including renewing, adjusting or prescribing medications as necessary.[11] In the case of CHF, this extends to making decisions about patient management such as medication titration in response to changing clinical status[13] and supporting patients in a holistic approach to managing their health, including co-morbidities.

METHODS

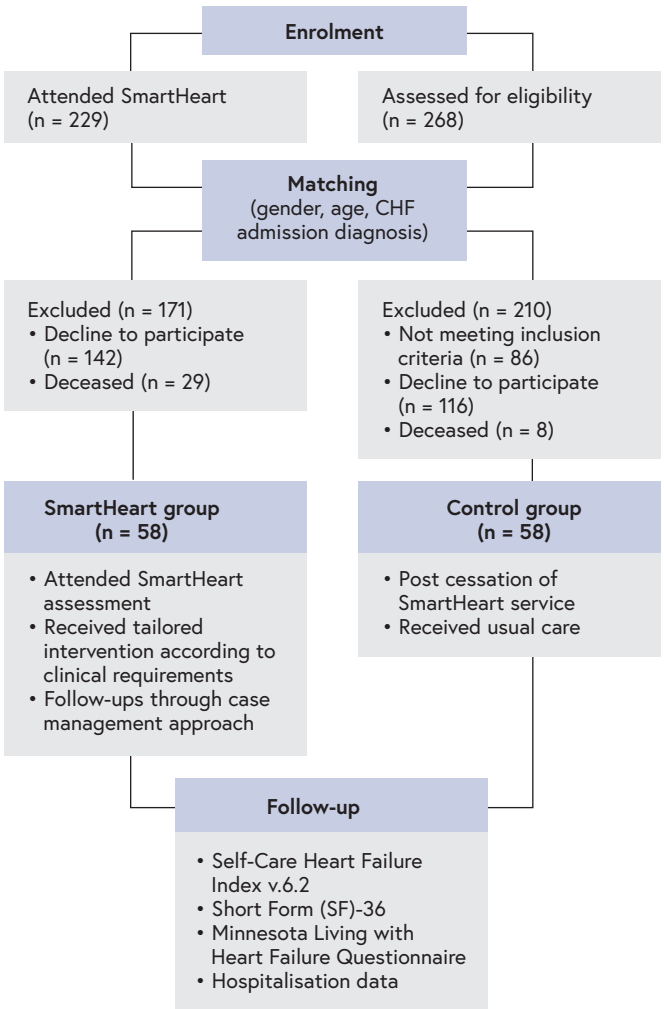
This study compared the effects of a community-based, CHF management program delivered by nurse practitioners, the SmartHeart Living Well with Heart Failure Service (SmartHeart), with usual care. We undertook a pragmatic trial to compare the effects of SmartHeart, with a control group who received standard post-discharge CHF care but did not have access to a specialised nurse practitioner CHF clinic.

This study was registered with the Australian New Zealand Clinical Trials Registry (Number 126140000421639). Ethics approval was obtained from the Human Research Ethics Committees at Royal Perth Hospital (REG 13–171) and Curtin University (HR12/2014). All participants in the study provided written informed consent.

PARTICIPANTS

Participants in the intervention group were recruited from patients who attended the SmartHeart service following a tertiary hospital admission and consented to take part in the study. Control participants were patients admitted to the same tertiary hospital following the cessation of the SmartHeart Service (Figure 1). The Control Group received usual care, including follow-up by a General Practitioner (GP) or Cardiologist. Inclusion criteria for both groups were a hospital admission due to CHF as documented by International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) diagnoses codes[14] (Supplementary File 1), a left ventricular ejection fraction of less than 40% and New York Heart Association Functional Class I-III. Patients were excluded from the study if they were unwilling or unable to provide informed consent, had been diagnosed with a terminal illness such as cancer and had an estimated life expectancy of less than one year, or had significant cognitive impairment or physical disability that was likely to impact on their capacity to engage in self-care behaviours.

FIGURE 1. PARTICIPANT ENROLMENT, GROUP ALLOCATION AND FOLLOW-UP



SMARTHEART INTERVENTION

Referral to SmartHeart occurred following tertiary hospital admission for CHF. SmartHeart was conducted in a multidisciplinary university clinic for 12 months and was designed to help patients understand their condition and its treatment to enhance self-care and maximise their utilisation of support services. At the patients' initial appointment, a nurse practitioner conducted a clinical assessment and patients were provided with education in self-management strategies and healthy lifestyle including the provision of an individualised CHF management plan, based on the Cardiac Society of Australia and New Zealand CHF Management Guidelines,[13] addressing medication adherence, diet, physical activity and maintaining fluid balance. Patients and their families received CHF education to support the patients in establishing an effective self-care regimen including adhering to prescribed medication with a flexible diuretics regime, restricting the intake of fluids and sodium and monitoring and early reporting of signs and symptoms characteristic of clinical deterioration such as weight gain, increased breathlessness and oedema. Co-morbidities were documented and follow up care for these conditions was arranged as indicated. At each visit, the nurse practitioner obtained an interim history and performed a general assessment on the patient including titration of patient medication as required with close monitoring of blood chemistry following medication adjustment in accordance with the advanced scope of practice afforded nurse practitioners. This enabled the nurse practitioners to tailor care according to clinical requirements and arrange subsequent follow-up appointments to suit patients' healthcare needs and goals through a case management approach. This included the option of clinic appointments, telephone follow up, home visits and clinics conducted through a mobile health service.[15] Frequency of visits was determined by the nurse practitioner based on the patient's clinical status. If the nurse practitioner identified that treatment wasn't consistent with guidelines, or there were signs of clinical deterioration (i.e. fluid retention, worsening symptoms), patients' GP and/or Cardiologist were consulted, and treatment was amended in accordance with best practice guidelines. When patients were stable and well informed about self-management, they were discharged from the service for ongoing care by their GP and/or Cardiologist, independent of SmartHeart. Discharge from the service routinely occurred within six months of the initial appointment.

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ASSESSMENTS

Demographic and clinical characteristics were collected from a medical record review.

Several questionnaires described below were administered by an independent nurse researcher after participants in the intervention group had engaged with, and been discharged from, the SmartHeart service approximately 12 months after patients' initial SmartHeart appointment (344.9±79.7 days; mean ± SD), to evaluate the enduring effect of the program on self-care behaviour and quality of life. In the control group, questionnaires were administered approximately six months after discharge following patients' index hospital admission (181.9±131.4 days).

Self-care behaviour was assessed by the Self-Care Heart Failure Index v.6.2 (SCHFI).[16] This questionnaire contains 22 items measured on a 4-point self-reported Likert scale divided into three subscales: self-care maintenance, self-care management, and self-confidence. The scores for each subscale range from 0 to 100 points. Higher scores reflect greater self-care behaviour and scores ≥70 points for each subscale indicate appropriate self-care behaviour.[16]

Generic quality of life (QoL) was assessed using the Short Form (SF)-36 questionnaire which provides information about individuals' multidimensional psychosocial health and includes a physical component summary (PCS) and mental component summary (MCS), comprising wellbeing and personal evaluations of health that is suitable for use in CHF trials when used in combination with disease-specific questionnaires.[17] PCS and MCS outcome measures are scored from 0 to 100, with 100 representing optimal health and 0 representing the poorest health on the scale.[17]

The Minnesota Living with Heart Failure Questionnaire (MLHFQ) was employed to assess disease-specific QoL. This tool measures the physical, emotional, social and mental dimensions of quality of life as it relates to CHF using a 6-point Likert scale.[18] MLHFQ is a 21-item scale, with a scoring range of zero for no impairment, to 105 for maximum impairment. It provides a total score (range 0–105, from best to worst QoL), as well as scores for two dimensions, physical (eight items, range 0–40) and emotional (five items, range 0–25).[19]

CLINICAL OUTCOMES

Hospitalisation data were collected from the Western Australian Hospital Morbidity Database. This health administrative data set records all hospital admissions in private and public hospitals, in both rural and metropolitan areas, in the state of Western Australia, providing a robust method for data linkage. Clinical outcomes included were hospitalisation due to all-causes and due to a primary diagnosis of CHF.

To ensure consistency between the SmartHeart Group and Control Group, patients start date for clinical outcome follow-up was derived from the date of discharge following their index hospital admission. The index hospital admission in the SmartHeart Group was defined as the admission that preceded their referral to SmartHeart. For the Control Group, the index hospital admission was the admission that resulted in the invitation to participate in the Control Group. Hospitalisation data were calculated from 30 days post-discharge of the index hospitalisation in both groups to enable sufficient time for those in the SmartHeart Group to commence the SmartHeart service. Readmission rates, length of stay, and emergency department presentations were subsequently reviewed for the 12-month period commencing at this time point, for both groups (Figure 2).

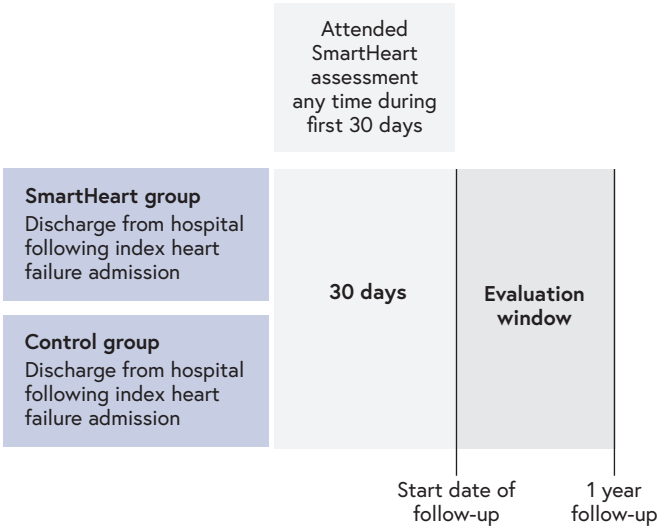

FIGURE 2. TIMELINE OF PARTICIPANT FOLLOW-UP.

STATISTICAL ANALYSIS

Data analysis was conducted using SPSS v25 software. Descriptive statistics were computed for sample demographics and reported using frequency distributions and percentages for categorical variables and mean and standard deviation for continuous variables. Differences between the control and intervention groups' total scores and individual question responses were analysed using paired t-tests. Pearson X2 test was used to test for differences in categorical variables and the t-test or Mann-Whitney test for continuous variables. The Kaplan–Meier product-limit method was used to describe time to clinical events (rehospitalisation due to CHF and all causes). The log-rank test was used to compare differences in time to the event between the groups. $P<0.05$ was considered statistically significant.

RESULTS

The study sample comprised of 58 participants in the SmartHeart Group and 58 participants in the Control Group. Participants in each group were well matched for gender, age, CHF severity, prescribed medication, and demographics. The majority of participants in each group had at least moderate heart failure (NYHA Class II-III) (Table 1). More than two-thirds of the participants were receiving government benefits (aged-pension, disability or sickness benefits) and over a third in each group lived alone.

TABLE 1: PARTICIPANT CHARACTERISTICS OF THE SMARTHEART VERSUS CONTROL GROUP

	SmartHeart = 58	Control N = 58
Demographic data		
Age	69.9 ± 13.2	67.9 ± 12.2
Female gender	19 (32.8%)	20 (34.5%)
Social status		
Lives alone	20 (34.5%)	25 (43.1%)
Lives with spouse	30 (51.7%)	31 (53.4%)
Lives with children	5 (8.6%)	2 (3.4%)
Lives with extended family	3 (5.2%)	0
Employment status		
Employed	13 (22.4%)	8 (13.8%)
Unemployed	4 (6.9%)	6 (10.3%)
Receiving Government benefits	41 (70.7%)	44 (75.9%)
Medical data		
LVEF	26.3%	22.7%
NYHA class: 1	18 (31.0%)	17 (29.3%)
NYHA class: 2	28 (48.3%)	30 (51.7%)
NYHA class: 3	12 (20.7%)	11 (19.0%)
NYHA class: 4	0	0
IHD	43 (74.1%)	35 (60.3%)
Non-IHD	15 (25.9%)	23 (39.7%)
AF	37 (63.8%)	31 (53.4%)
T2DM	29 (50.0%)	20 (34.5%)
Pacemaker	10 (17.2%)	8 (13.8%)
ICD	12 (20.7%)	10 (17.2%)
Medications		
ACE inhibitor	38 (65.5%)	32 (55.2%)
Angiotensin II blocker	13 (22.4%)	12 (20.7%)
Beta-blocker	46 (79.3%)	37 (63.8%)
Loop inhibitor	40 (69.0%)	45 (77.6%)
Aldosterone antagonist	24 (41.4%)	25 (43.1%)
Digoxin	14 (24.1%)	7 (12.1%)
Warfarin	10 (17.2%)	11 (19.0%)

All data presented as n (%) or mean ± SD unless specified otherwise. There were no significant differences between groups.

LVEF = Left ventricular ejection fraction; NYHA = New York Heart Association; IHD = Ischaemic heart disease; AF = atrial fibrillation/atrial flutter; T2DM = Type II Diabetes Mellitus; ICD = Implantable cardioverter defibrillator; ACE = angiotensin converting enzyme.

Awareness of self-care behaviour was significantly higher in the SmartHeart compared with the Control Group for all three subscales; self-care maintenance, self-care management and self-care confidence ($p<0.05$) (Table 2).

There was a higher rating for the MCS component of the SF-36 in the SmartHeart Group, but no difference in PCS (Table 2).

For the disease-specific MLHFQ, participants in the SmartHeart Group rated their overall QoL significantly better than the Control Group. Similarly, there was a significantly better rating of physical ($p<0.05$) and emotional ($p<0.05$) functioning in the SmartHeart, compared with the Control Group (Table 2).

TABLE 2: SELF-CARE AND QUALITY OF LIFE QUESTIONNAIRE OUTCOMES OF PARTICIPANTS IN THE SMARTHEART VERSUS CONTROL GROUP.

	SmartHeart	Control	t	p-Value
SCHFI				
Maintenance	76.7 ± 10.9	52.1 ± 16.1	9.68	p< 0.05
Management	82.0 ± 13.3	46.4 ± 16.4	10.57	p< 0.05
Confidence	88.7 ± 14.6	40.6 ± 21.0	14.11	p< 0.05
SF-36				
PCS	47.4 ± 12.8	45.4 ± 12.4	0.93	NS
MCS	81.7 ± 23.8	61.6 ± 22.0	3.81	p< 0.05
MLHFQ				
Total score all items	28.4 ± 14.6	49.6 ± 21.6	-6.19	p< 0.05
Physical items	13.9 ± 7.6	22.0 ± 9.6	-5.07	p< 0.05
Emotional items	5.4 ± 4.1	11.3 ± 6.0	-6.20	p< 0.05

All data presented as mean ± SD. SCHFI = Self-Care Heart Failure Index; PCS = Physical Component Summary; MCS = Mental Component Summary; MLHFQ = Minnesota Living with Heart Failure Questionnaire.

SmartHeart participants had delayed, and fewer overall, rehospitalisation events compared to participants in the Control Group over the 12 month follow up period; 43 participants in the Control Group compared with 36 participants in the SmartHeart Group were hospitalised at least once over 12 months of follow up ($p<0.05$) (Figure 3).

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Mean length of stay for all-cause hospitalisations was significantly lower (p<0.05) in the SmartHeart Group, leading to a lower total number of days of hospitalisation (p<0.05). Analysis of all-cause hospitalisation, excluding rehabilitation admissions, revealed that mean length of stay tended to be lower in the SmartHeart Group, achieving borderline statistical significance (p=0.05) compared with the Control Group (Table 3).

TABLE 3: HOSPITAL READMISSIONS AND EMERGENCY DEPARTMENT PRESENTATIONS OVER ONE YEAR OF FOLLOW-UP IN THE SMARTHEART VERSUS CONTROL GROUP

	SmartHeart (n = 58)	Control (n = 58)	p-value
ED presentations			
Participants with 0 presentations, n (%)	24 (41.4)	26 (44.8)	NS
Participants with 1 presentations, n (%)	12 (20.7)	15 (25.9)	NS
Participants with 2 presentations, n (%)	7 (12.1)	8 (13.8)	NS
Participants with ≥ 3 presentations, n (%)	15 (25.9)	9 (15.5)	NS
Total ED presentations	89	93	NS
Hospital admissions			
Chronic heart failure related			
Number of admissions, n	23	24	NS
Mean length of stay (days)	1.8 ± 6.4	2.8 ± 5.9	NS
Total (days)	102	163	NS
All-cause			
Number of admissions, n	131	113	NS
Mean length of stay, all-cause (days)	9.0 ± 11.5	20.1 ± 21.6	p< 0.05
Total (days)	416	664	p< 0.05
All-cause, excluding rehab. admissions			
Number of admissions, n	130	106	NS
Mean length of stay (days)	8.2 ± 11.2	14.9 ± 16.6	(p=0.05)
Total (days)	401	493	(p=0.05)

All data presented as n (%) or mean ± SD unless specified otherwise.
ED = Emergency Department.

There were no differences in the number of CHF-related hospital admissions or length of stay due to a CHF admission. Similarly, neither the total number of Emergency Department presentations nor the number of participants with zero, one, two or at least three Emergency Department presentations differed between groups.

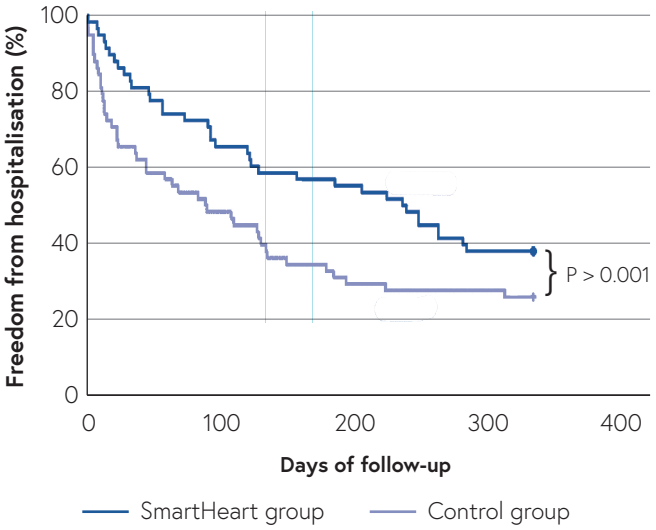

FIGURE 3 ALL CAUSE HOSPITAL ADMISSION IN THE SMARTHEART AND CONTROL GROUPS.

DISCUSSION

In this evaluation of the effect of a community-based, nurse-practitioner led CHF management service, we observed significantly higher awareness of CHF self-management strategies and better quality of life in patients who had received nurse practitioner support compared with a well-matched cohort of patients who did not attend the clinic. While this was not associated with a reduction in CHF-related admissions, participants receiving the SmartHeart intervention had lower all-cause hospitalisations than the Control Group, suggesting improved management of the co-morbidities commonly experienced by patients with CHF.

Patients receiving the SmartHealth intervention had better self-care across the subscales of 'management', 'maintenance', and 'confidence'. Education was a core component of the nurse practitioner service and was provided via written material, through face to face consultations and by phone call follow up between nurse practitioners and patients. Patient education is an important facilitator of self-management, through improved awareness of signs and symptoms, and better adherence to a healthy lifestyle and medical treatment.[20] Patients with CHF frequently lack the knowledge, confidence, and support to be actively involved in their own care, and their adherence to behaviours important for long-term health is often suboptimal.[15] Notably, in the current study, the higher level of self-care behaviour in the SmartHeart Group compared with Controls, was sustained for at least six months following the completion of the SmartHeart program, highlighting that a time-limited intervention can have ongoing benefits. Improved self-care behaviour has previously been associated with an improved ability to recognise and respond appropriately to adverse signs and symptoms of CHF,[21] which in turn has been associated with reduced emergency department visits[22] and hospital admissions.[21] In the current

study, better self-care metrics did not translate to a reduction in CHF related hospitalisations. The lack of a significant effect may reflect the relatively small sample size and limited power to detect a significant difference. We also excluded hospital admissions in the first month following hospital discharge, which is known to be the period that patients are at highest risk of readmitting,[23] which would likely have reduced the sensitivity of the project to detect a change in CHF admissions. Nevertheless, it is apparent that evidence-based strategies should be tailored to patient's individual needs, while communicating best practice standards for CHF disease management.

The study observed that patients with CHF who received nurse practitioner support experienced significantly better psychosocial outcomes and had better self-management strategies than those who did not. These findings are comparable with other studies which have found that patients who have attended a nurse-delivered CHF program feel more capable of dealing with disease-related symptoms and experience a better QoL than those who did not participate in such programs.[20] The results of our study validate the contribution of a nurse practitioner-led self-management intervention in attaining better patient outcomes including improved self-care behaviour and QoL. The results also suggest that the community-based intervention encouraged patients' maintenance of self-care behaviours, highlighting the value of nurse practitioner-patient engagement.

While there was no difference between groups in all-cause or CHF specific hospitalisations during the 12 month follow up period, participants who engaged in the SmartHeart program had delayed rehospitalisation, a shorter mean length of stay and lower overall days of hospitalisation due to all causes. Higher self-care maintenance has previously been found to be associated with reduced all-cause hospitalisation length of stay in a nurse-led CHF clinic.[24] Together, these findings provide support for community-based CHF clinics as a valuable adjunct to medical care in the management of CHF and that the advanced skills of nurse practitioners are well suited in this context. The lower total days of hospitalisation observed in the SmartHeart Group was due predominantly to lower admissions to rehabilitation settings due to post-fall complications which were more prevalent in the Control Group. The high rate of rehabilitation-related admissions may reflect the mean age of participants in the study (almost 70) who may be at increased risk of frailty due to the effect of long-term chronic illness, impaired mobility, cognitive impairment, and medication.[25] CHF and frailty often co-exist and patients with both are likely to have worse outcomes including falls, hospitalisation, and mortality.[7]

LIMITATIONS OF THE STUDY

There are several limitations to this study that warrant highlighting. The objective of the study was to conduct a pragmatic trial to evaluate the efficacy of a 'real world' nurse practitioner-led CHF program, compared with standard post-discharge care which did not include the provision of formal post-discharge education and support for CHF self-management. The Control Group was recruited post cessation of the nurse practitioner-led CHF program due to time-limited nature of funding for the SmartHeart service. Furthermore, because the SmartHeart program was delivered using a flexible approach according to what the nurse practitioners deemed most appropriate for individual patients, it is not possible to determine which specific aspects of nurse practitioner care contributed to the observed outcomes, nor whether similar outcomes would have been achieved by registered nurses. Another potential limitation relates to the difference in the length of time that had elapsed between the index admission and the evaluation of self-care behaviour and QoL, which was approximately 12 months in the SmartHeart group compared with approximately six months in the Control Group. However, this supports the sustainability of the SmartHeart intervention.

CONCLUSION

The current study shows that a nurse practitioner-delivered model of chronic disease management results in better self-care behaviour, improved quality of life and reduced hospital admissions, compared with usual care in patients with CHF. These findings are particularly relevant to older patients with co-morbidities, many of whom are managed in a primary care setting. Based on these findings, programs of this nature should be more widely available to help address the challenges of managing patients with CHF in primary healthcare.

IMPLICATIONS FOR RESEARCH, POLICY, AND PRACTICE

Nurse practitioner-delivered models of CHF management should be more widely available to help address the challenges of managing patients with CHF in primary care. Future randomised controlled trials, that are adequately powered to evaluate the effects of nurse practitioner support on CHF hospitalisations and mortality, are required to more comprehensively investigate the effects of nurse practitioner management of CHF in a community setting.

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