American Academy of Nurse Practitioners

RESEARCH

# The impact of nurse-directed patient education on quality of life and functional capacity in people with heart failure

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## Abstract

**Purpose:** The purpose of this research was to evaluate the impact of a nurse-directed approach to patient education, which focused on lifestyle modification, daily weight management, diet, and medication compliance to improve the quality of life (QOL) and functional capacity in people with heart failure.
**Data sources:** This was a prospective quasiexperimental multicenter research study of 23 patients comparing a nurse-directed care (NC) group ($n = 13$), which received comprehensive disease management education and weekly telephone follow-up, and the routine care (RC) group ($n = 10$) that received protocol-driven medical management. The study length was 12 months.
**Conclusions:** Analysis of covariance (ANCOVA) was used to test for equality of variance–covariance matrices in the study population over time. ANCOVA measured baseline and two data intervals for a total of 9 months between the control and experimental (NC and RC) groups. There was statistically significant improvement in the NC group for the domains of total QOL: $F = 3.569$, $p = 0.000$; health and function: $F = 3.995$, $p = 0.003$; social and economic: $F = 14.109$, $p = 0.000$; psychological and spiritual: $F = 13.212$, $p = 0.000$; and family: $F = 2.384$, $p = 0.048$. Functional capacity was not significantly impacted by the study team interventions ($F = 0.228$, $p = 0.949$).
**Implications for practice:** Results indicate that nurse-directed patient education was effective in improving QOL. A nurse-directed treatment strategy significantly improves patients' role in symptom control and disease self-management.

## Introduction

Heart failure is a major public health problem in the United States and is the most common discharge diagnosis in the population of people over 65 years. The prevalence of heart failure continues to rise involving approximately 5 million Americans, with 500,000 newly diagnosed cases each year (American Heart Association, 2003). Because of the aging U.S. population and the successful treatment of underlying conditions that cause heart failure, such as coronary artery disease and hypertension, the number of people with heart failure continues to increase. Economically, heart failure is currently the most costly health-care problem, with annual federal expenditures for diagnosis and treatment of approximately 38 billion dollars (Basile, 2001).

Primary care providers, not cardiologists, treat most patients and play a key role in improving clinical outcomes in patients with and at risk for heart failure. Therefore, it is essential that primary care providers be aware of the best and most current approaches to the prevention, diagnosis, and treatment of this disease. Educating patients about their disease and motivating and monitoring their adherence to a course of therapy are critical aspects in promoting positive outcomes (Basile, 2001).



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The purpose of our project was twofold: first, to evaluate the impact of a nurse-directed approach to patient education focusing on lifestyle modification, daily weights, medication, and diet compliance in order to improve the quality of life (QOL) and functional capacity in people with heart failure; second, to evaluate the extent to which patient education about self-care disease management influenced QOL and functional capacity.

The following question was posed: Does improved QOL correlate with improved functional capacity?

## Quality of life

Researchers generally agree upon three important properties of QOL: it is a multifactorial, subjective, and temporal concept (Grady, 1993). Dracup, Walden, Stevenson, and Brecht (1992) reported that QOL refers to a polymorphous collage that embraces a patient's level of productivity, the ability to function in daily life, the performance of social roles, intellectual capabilities, emotional status, and life satisfaction.

QOL as defined by Ferrans and Powers (1992) relates to a sense of well-being that stems from a satisfaction with the areas of life that are important to an individual. The impact of heart failure on the QOL is described in terms of the physical limitations, reduced capacity to perform activities of daily living, and inability to work imposed by the disease (Dracup et al., 1992). People with heart failure experience depression, anxiety, and reduced social functioning and thus describe their QOL as poor (Grady, 1993).

## Functional capacity

Functional capacity as defined by Wenger (1989) encompasses a person's ability to carry out the usual activities of day-to-day life. This includes the physical performance of self-care activities, the energy and ability to perform necessary daily activities, the ability to obtain adequate sleep and rest, mobility, independence, and the capacity to participate in occupational and recreational activities. We have chosen this as our operational definition for functional capacity in this study.

## Treatment approaches

Treatments for heart failure have improved outcomes in the past 10 years, and evidence-based guidelines provide a structured approach to the treatment of heart failure. Clinical trials have shown that maximizing pharmacotherapy in conjunction with nurse-directed patient education and follow-up reduces hospital admissions, decreases morbidity and mortality, and improves the QOL for patients with heart failure. A nurse-directed multidisciplinary approach to heart failure management incorporates both patient monitoring and self-management of symptoms as a central strategy. Targeting risk factors for unplanned readmissions in concert with protocol-driven medical management should improve the QOL in patients with heart failure.

Clinical trials by Blackwood, Mayor, Gurnham, and Armstrong (1991) compared two active treatments, digoxin and xamoterol, and placebo in patients with heart failure to study the pharmacological effects on exercise capacity and QOL in the treatment of heart failure. Results of this trial found improvements in exercise capacity and QOL in all three groups without significant differences. However, the authors theorized that the substantial benefit seen in the placebo group was because of the increased attention from the medical research staff. This suggests that there is therapeutic value in special heart failure clinics. Packer et al. (2003) studied the effects of carvedilol on survival in severe chronic heart failure, which demonstrated that patients receiving carvedilol experienced no increased cardiovascular risk but instead had fewer deaths. The results showed that the differences between the study group and placebo group were in favor of carvedilol as early as 14–21 days following initiation of treatment. In summary, these trials demonstrate there is significant reduction in morbidity and mortality with protocol-driven medical management.

## Measuring QOL

A wide variety of measurement tools have been used to assess QOL in patients with heart failure. In much of the medical literature (Eichhorn, 2002; Francis, 2001; Hoyt, 2001), the assessment of QOL was part of a drug trial to examine drug efficacy in the treatment of heart failure. Only a few studies to date (Blackwood et al., 1991; Dracup et al., 1992; Hawthorne & Hixon, 1994) have provided a definition of QOL as a basis for the selection of measurement tools. The dimensions of QOL that have been examined include health, physical ability, psychological state, social involvement, and work or financial areas. The Ferrans and Powers (1992) QOL Index-Cardiac IV tool consists of two parts: the first measures satisfaction with various aspects of life, and the second measures importance of those aspects. The domains measured are overall QOL as well as health and function, psychological/spiritual, social and economic, and family. This instrument includes all prior examined dimensions of QOL as well as measuring illness-specific QOL related to cardiac disease (Ferrans & Powers). QOL represents an important outcome variable, which can vary within this patient population.

Hawthorne and Hixon (1994) did a quasiexperimental study of functional capacity, mood disturbance, and QOL

in 50 subjects with heart failure. QOL in this study was measured using the Ferrans and Powers (1992) QOL Index-Cardiac tool. The overall goal was to evaluate the feasibility and effects of a model of nursing care designed to decrease or prevent recurrent hospitalizations. The interventions by the researchers were focused on patient education and telephone follow-up. The study findings indicated that heart failure patients experience significant mood disruption that is greater than that reported by other types of cardiac patients. Results also support that subjects benefited from follow-up and patient education through enhancing self-care and reduction of disease uncertainty.

Richardson (2003) did a critical review on the effects of depression, treatment adherence, and social support in patients with heart failure, and concluded that interventions should be targeted to these problems. Healthcare professionals must include an assessment of these issues in all patients with heart failure. Specific needs must be addressed and interventions tailored appropriately when warranted.

### Multidisciplinary care

The published work on multidisciplinary care (MDC) of patients with heart failure has shown significant reductions in rehospitalization rates, predominantly as a result of patient education, close clinical follow-up, and optimization of outpatient medical care. Notwithstanding the importance of drug therapy, nonpharmacological approaches to the care of the heart failure patients are increasingly important as the severity of the heart failure advances.

Rich et al. (1995) conducted a prospective, randomized trial on the effect of a nurse-directed, multidisciplinary intervention on rates of readmission within 90 days of hospital discharge, QOL, and costs of care for high-risk patients 70 years of age or older who were hospitalized with heart failure. The intervention consisted of comprehensive education of the patient and family, a prescribed diet, social service consultation and planning for early discharge, a review of medications, and intensive follow-up. Results of this study demonstrated that the primary outcome measure (90 days without readmission) was achieved in 91 of the 142 patients in the treatment group, as compared with 75 of the 140 patients in the control group who received conventional care. The cost of care in the treatment group was reduced by $460 per patient because of the reduction in hospital admissions.

McDonald et al. (2002), in a randomized control study of 98 patients with stage IV heart failure, found that MDC of heart failure patients provides essential and significant additional benefits. Their study focused on patients in hospital, comparing those with routine care (RC) and those with MDC. Both underwent similar investigation and received optimal medical therapy. Patient education was discussed as well as evaluation of the patient's status. At 3 months, evaluation of both RC and MDC were done. More patients died in the RC group (25.5%) compared with the MDC group (7.8%). Overall rehospitalization for heart failure was far more frequent in the RC group (25.5%) compared to the MDC group (3.9%).

QOL is an important measure in heart failure patients, and this disease has a significant impact on both QOL and functional capacity. The severity of heart failure is graded by the level of functional capacity. In summary, a nurse-directed, multidisciplinary intervention approach to heart failure treatment can improve QOL and reduce hospital use and medical costs for patients.

### Hypotheses

Patients who participate in a nurse-directed patient education approach to heart failure treatment with complimentary medical management will experience fewer readmissions and will demonstrate an increased knowledge of self-care management. Patients who participate in a nurse-directed patient education approach to heart failure will experience improved QOL and functional capacity.

## Research methods

### Research design

This study is a quantitative quasiexperimental design, comparing a nurse-directed care (NC) group and a medical management RC group.

### Sample

All patients 18–75 years of age who were referred to the cardiology clinic for evaluation of heart failure symptoms were considered for inclusion in the study. The design flow chart (Figure 1) was developed to identify the process of patient flow through the program.

Study site #1 (NC group) was located in a community-based hospital medical clinic managed by a medical physician with a subspecialty in cardiology and a cardiac nurse specialist. The patient referrals were from the monthly cardiology clinic managed by a cardiologist. Study site #2 (RC group) was located in the cardiology clinic set in an inner city medical center where the patients were managed by a cardiologist and cardiac fellows. The patient referrals were from the cardiology clinic population. Both sites were comparable in the medical management and patient population mix.

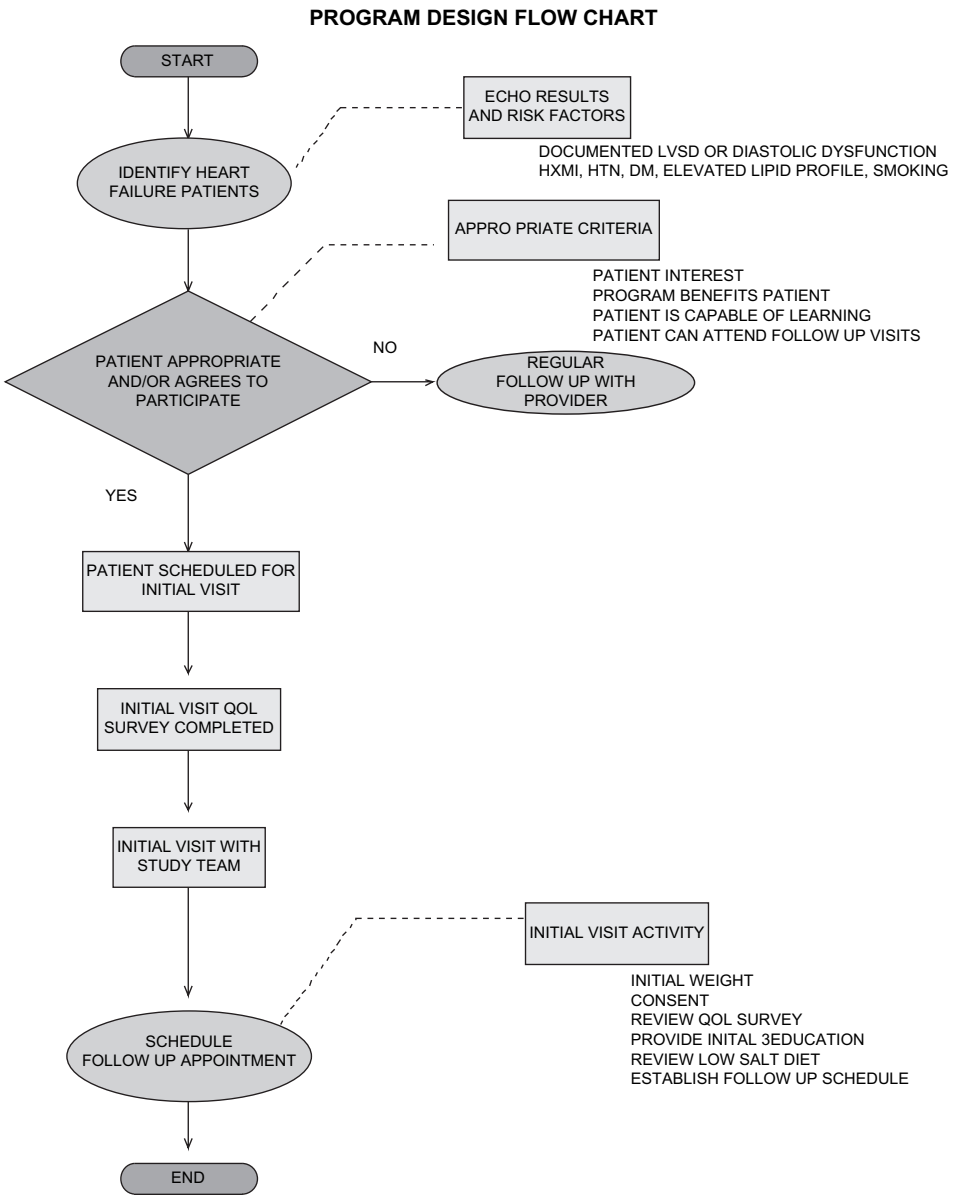


**Figure 1** Program design flow chart.

All patients enrolled had a diagnosis of heart failure confirmed by a cardiologist based on echocardiography with evidence of left ventricular systolic dysfunction or diastolic dysfunction (Figure 1). Patients who were not literate in English were excluded. Patients presenting with heart failure in the setting of myocardial infarction or unstable angina or in whom failure was not thought to be the primary problem, or for whom heart failure was a secondary diagnosis in conjunction with multiple chronic comorbidities, were excluded. Also, patients with illnesses that could compromise survival over the duration of the study (e.g., cancer) or with cognitive impairment, or who were taking mood-altering medications (antipsychotics, antianxiety, and antidepressant agents) were excluded. The baseline characteristics gathered on the total population, NC group, and RC group, included gender, marital status, average ejection fraction percentage, New York Heart Association (NYHA) classification, etiology, risk factors, and medications (see Table 1).

All patients were told the purpose of the study and signed an informed voluntary written consent form (approved by the institutional review boards) indicating their willingness to participate. Patients were informed that their responses would be kept confidential and that

**Table 1** Baseline demographic characteristics of total population, NC group, and RC group

| Demographics | NC group | % | RC group | % |
|---|---|---|---|---|
| Gender | | | | |
| Male | 2 | 7 | 6 | 26 |
| Female | 11 | 48 | 4 | 17 |
| Marital status | | | | |
| Married | 6 | 26 | 3 | 13 |
| Single | 7 | 0 | 7 | 4 |
| Average EF (%) | 48 | | 45 | |
| NYHA class | | | | |
| Class I | 0 | | 0 | |
| Class II | 11 | 48 | 10 | 43 |
| Class III | 2 | 9 | 0 | |
| Class IV | 0 | | 0 | |
| Etiology of HF | | | | |
| Ischemic cardiomyopathy | 3 | 13 | 6 | 26 |
| Hypertension | 8 | 35 | 3 | 13 |
| Alcoholic cardiomyopathy | 2 | 9 | 0 | |
| Idiopathic | 0 | | 0 | |
| Valvular | 0 | | 1 | 4 |
| Risk factors | | | | |
| Hypertension | 8 | 35 | 3 | 13 |
| Diabetes mellitus | 2 | 9 | 1 | 4 |
| Smoking | 3 | 13 | 4 | 17 |
| Alcohol abuse | 2 | 9 | 0 | |
| CAD | 3 | 13 | 6 | 26 |
| Medications | | | | |
| ACE inhibitor | 13 | 57 | 10 | 43 |
| Diuretic | 13 | 57 | 10 | 43 |
| Beta-blocker | 13 | 57 | 10 | 43 |
| Digoxin | 1 | 4 | 2 | 9 |
| Other | 4 | 17 | 2 | 9 |

*Note*. $N = 23$; average age: NC, 60; RC, 56; ACE, angiotensin-converting enzyme; CAD, coronary artery disease; EF, ejection fraction.

under no circumstances would their participation or lack of participation influence treatment decisions or jeopardize their care. Patients were interviewed to determine their hospitalization history and the length and nature of symptoms associated with heart failure. Severity of symptoms was assessed by categorizing the patients according to the NYHA functional classifications: class I, unlimited activity without cardiac symptoms; class II, ordinary physical activity causes fatigue, dyspnea, or palpitations; class III, marked limitation of activity and symptoms with less than usual activity but no symptoms at rest; and class IV, any physical activity is accompanied by symptoms, and symptoms may occur at rest.

## Setting and plan of action

The patients were evaluated in the clinic setting at the study sites. At the time of evaluation, the NC group patients were informed of the following criteria for study inclusion: monthly follow-up appointments for a period of 12 months; a baseline echocardiogram on the initial visit; a baseline 12-lead electrocardiogram on initial visit; a QOL index survey was asked on the initial visit, again at 3 and 9 months; documentation of daily weights on the monthly calendar provided; and completion of a 6-min walking test on the initial visit and again at 3 and 9 months to measure functional progress.

A physical examination performed by the clinical nurse specialists/researchers, which consisted of cardiac heart sounds, pulmonary auscultation, abdominal girth measurement, and extremity assessment, was done with every visit to evaluate for the presence and severity of any fluid retention. Protocol-driven medical therapy was initiated and the clinical nurse specialists/researchers developed the individualized educational plan. The medical physician (site #1) and cardiologist (site #2) on a case-by-case basis decided the protocol-driven medication regimen. The nurse-directed intervention for patient education included daily weight charting and an education booklet for patients and family, which described heart failure, listed recommendations to maintain a heart healthy lifestyle and signs and symptoms of changes in condition status that warrants medical notification. Medication compliance counseling consisted of development of an individualized medication grid sheet listing each medication, dosage strength, administration schedule, and mechanism of action to reinforce the importance of compliance. Diet and nutrition counseling incorporated a food exchange list, food preparation tips, and a four-step approach to managing a low-salt diet. Individualized counseling concentrated on exercise, smoking cessation, and elimination of alcohol intake. Interventions were monitored by telephone follow-up in between monthly visits on a weekly basis by the researchers. A standard questionnaire was utilized to maintain consistency in patient response.

The RC group was informed of the following criteria for the study: follow-up appointments to the cardiology clinic every 3 months as scheduled for medical management. On each cardiology visit, the study team initiated a QOL survey and a 6-min walk test to measure functional capacity. Smoking cessation, medications, diet, and nutritional counseling was provided with each 3-month visit. Weekly telephone follow-up was not included in the RC group.

## Instrument

The QOL used in this study was developed by Ferrans and Powers (1992) to measure the QOL in terms of satisfaction with life. The instrument was selected because of its high level of reliability, validity, and sensitivity based on Cronbach's alphas, which ranged from .84 to .98 across

26 studies. The QOL measures both satisfaction and importance of various aspects of life. Importance ratings are used to weight the satisfaction responses so that scores reflect the respondents' satisfaction with the aspects of life they value. The instrument consists of two parts: the first measures satisfaction with various aspects of life, and the second measures importance of those aspects. Scores are calculated for QOL overall and in four domains: health and functioning, psychological/spiritual, social and economic, and family. Scores range from 0 to 30 with a significant correlation between higher QOL and higher scores.

The objective measure of functional capacity was obtained using a 6-min walk test. Patients were told to walk at a brisk pace as far as they could within the allotted time, resting as needed. The limitation of the 6-min walk test is the inability of the researchers to standardize it with regard to step length and pace. We attempted to minimize differences in the method at each site by using the same physical area each time, by standardizing directions given to the patients, and by having the same researcher supervise all 69 walking tests.

## Results

### Characteristics of sample

Out of 65 eligible patients, 23 patients (13 from site #1 and 10 from site #2) consented for study participation. The mean age of the study participants was 58 years old; 65% were women and 35% were men. Average ejection fraction for the sample was 47%, with no significant differences for this value found by group membership, gender or race. The average number of medications taken was six and is consistent with the complex treatment that is characteristic of this illness. In terms of illness management, 80% of the RC group either reported never being placed on or did not follow a low-sodium diet, and compliance with taking medications was low. Two patients from the NC group participated in a formal exercise program through cardiac rehabilitation. Eighty-four percent of the NC group and 40% of the RC group engaged in weekly exercise activities. Sixty percent of the RC group managed their illness by restricting their activities and taking frequent rests. There were no deaths, hospital readmissions, nor any patients lost to follow-up in either group during this study. Age, race, and economic status did not differ significantly between patients who participated in the study.

The data were analyzed using the Statistical Package for Social Sciences to correlate the influence between the variables with study outcomes. Analysis of covariance was used to test for equality of variance–covariance matrices in the populations.

Levene's test of equality of error variances (see Table 2) tested the null hypothesis that the error variance of the dependent variable of QOL is equal across groups. Each group, NC ($n$ = 13) and RC ($n$ = 10), was tested for error variance of the dependent variable. The independent variables consist of the four subdomains: health and function, social and economic, psychological and spiritual, and family. The QOL index tool used ordinal measurement to gauge satisfaction between the dependent and independent variables in the study. The result demonstrated that there was a difference between groups.

When the dependent and independent variables were compared between groups (NC and RC), there was a statistically significant improvement in the NC group for the following domains: total QOL ($F$ = 13.569, $p$ = 0.000), health and function ($F$ = 3.995, $p$ = 0.003), social and economic ($F$ = 14.109, $p$ = 0.000), psychological and spiritual ($F$ = 13.212, $p$ = 0.000), and family ($F$ = 2.384, $p$ = 0.48) (see Table 2). The results support that nurse-directed, focused intervention does have a significant impact on improving QOL. However, data analysis reveals no statistical significance between the NC group and the RC group with regard to functional capacity ($F$ = 0. 228, $p$ = 0.949).

Data analysis reveals that QOL scores at 9 months (Figure 2) improved more from baseline for patients in the NC group than in the RC group (Figures 3 and 4). Although QOL improved in both groups, there was significantly more improvement in the treatment group. In addition, QOL improved consistently on each of the four subscales among the patients in the NC group (range, 36%–50%). The most significant improvement over the 9-month study period was in the domain of health and function. The NC group had a 62% improvement versus a 25% improvement in the RC group. Functional capacity (Figure 5) improved in both groups; however, over the 9-month study period, the NC group had a more progressive improvement than the RC group (73% increase versus 9% increase). Therefore, the results support that there is a correlation between QOL and functional capacity.

**Table 2** Levene's test of equality of error variances[a]

| | *F* | df 1 | df 2 | Significance |
|---|---|---|---|---|
| Total QOL | 13.569 | 5 | 63 | .000 |
| Health and function | 3.995 | 5 | 63 | .003 |
| Social and economic | 14.109 | 5 | 63 | .000 |
| Psychological and spiritual | 13.212 | 5 | 63 | .000 |
| Family | 2.384 | 5 | 63 | .048 |
| Functional capacity | .228 | 5 | 63 | .949 |

Tests the null hypothesis that the error variance of the dependent across groups.

[a]Design: intercept + NCRC + test + NCRC × test. NCRC, Nurse care routine care.

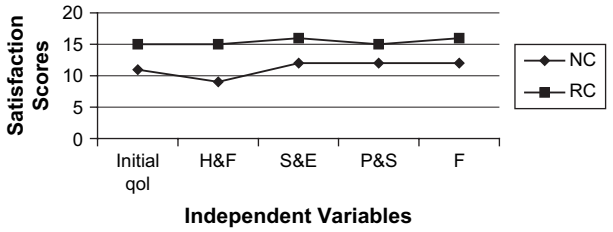


**Figure 2** Initial data point between-group QOL.

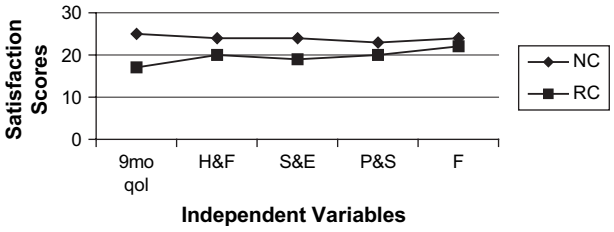


**Figure 4** Final data point between-group QOL.

## Discussion

The research interventions in this study were directed toward increasing QOL and activity tolerance through nurse-directed patient education; lifestyle modification, and outpatient exercise regimens. This study focused specifically on the underserved patients with heart failure who were identified to be at high risk for early readmissions, and our interventions addressed targeted causes of rehospitalization (lifestyle, medication and diet noncompliance, and lack of self-care disease management). The study setting sites were in ambulatory outpatient clinics, where as prior studies focused interventions on hospitalized heart failure patients. The literature theorized that outpatient management should be successfully provided by primary care providers, not cardiologists. This study did prove that successful management of heart failure patients was provided by primary care providers and clinical nurse specialists. The outcomes of this study also demonstrated that improved QOL does correlate with improved functional capacity.

The NC group patients described their most positive changes in their overall QOL as relating to their ability to self-manage their diet and medications, which stemmed from the monthly patient education sessions provided by the study team. The physiological changes experienced as a result of medical and nonpharmacological regimens improved patients overall exercise tolerance and ability to maintain independence. The improved QOL and functional capacity as observed in this population has proven to be a predictor of adjustment to illness and disease self-management. The mean distance walked in our population was 1081 feet, only slight lower than the 1094 feet walked in the RC group. The limited time measurements used in this study did not provide data about the sensitivity of the walk test to changes in clinical status over time or to its reproducibility. The 6-min walk test proved to be an inexpensive and uncomplicated but limited clinical measure of exercise capacity.

### Future research

Further evaluation of functional capacity and NYHA classification to test sensitivity for differences in clinical status of heart failure patients would require further study. Interventions directed at depression and lower QOL require continued study to identify if any specific domains such as satisfaction with social life, limited activity, and depression are associated with greater risk for mortality and heart failure–related hospitalizations. A significant number of patients could not be included in this study because of either language barrier or illiteracy. This represents a significant limitation of the present study given the high rate of functional illiteracy in the United States, along with the complexity of the illness management regimen needed for most heart failure patients. It is imperative that the needs of these patients be described and interventions for self-care be developed in future studies. Another limitation to this study was the small sample size. Last, further development of reliable and sensitive self-report and observer-related specific measures for study population would also be useful in the future.

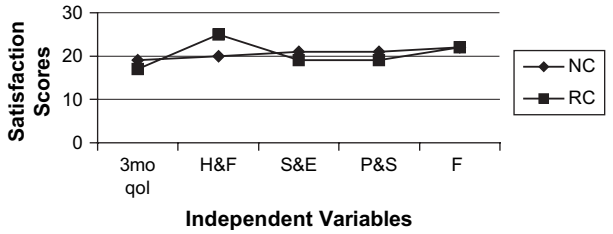


**Figure 3** First data point between-group QOL.

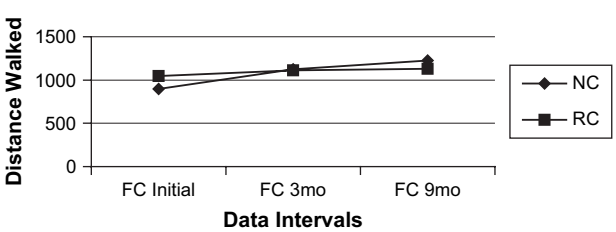


**Figure 5** Between-group functional capacity.

## Conclusions

In our opinion, the improved QOL in our patients was a direct result of the study intervention. Patients were never without questions during each visit, and several patients were averted from either emergency room visits or rehospitalizations by timely interaction with the study team. The focused nature of the intervention, the close monitoring, and follow-up support our hypothesis and our explanations for our findings. Routine measurement of QOL in this population both before and after aggressive medical therapy will provide answers as to who is most likely to benefit and is an important indicator of treatment efficacy. A significant portion of these patient crises are avoided through interventions that improve patient compliance with prescribed management protocols and improve recognition of early warning signs of clinical problems.

Thus, as management of symptoms and the work associated with the regimen needed to achieve symptom control are necessary elements in successful management of any chronic illness, heart failure patients participating in a nurse-directed symptom management program can be expected to achieve better outcomes than patients who do not learn to actively participate in self-management. The participants in this study were able to demonstrate disease self-management through providing daily sodium intake calculations, documentation of daily weights, and verbalization of medication regimens (dosages and administration schedules) on a monthly basis to the study team. This study demonstrated that a nurse-directed treatment strategy significantly improved the QOL for patients, improved functional capacity, and prevented hospitalizations in patients with heart failure.

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### Conflict of Interest Statement

No relationship that might represent a conflict of interest exists between the authors and any commercial entity or product mentioned in this article. No commercial entity has made any inducements to submit this article for publication.