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Congestive heart failure (CHF) is a significant health problem in the U.S. There are over 2 million Americans diagnosed with CHF, with 200,000 CHF related deaths every year. A CHF Comprehensive Care Program in a Northern California medical center began in August, 1997 to case manage and educate CHF patients and their family members. The program educated CHF patients to self-manage the chronic condition by daily weight, low sodium diet, medication adherence, activity and rest balance, and daily exercise. This study used a one group. Pre and post test study design to evaluate the effectiveness of the CHF program. The results showed statistically significant improvement in three functional health status measures, using the New York Heart Association Classification, Duke Activity Status Index, and 6 Minute Walk Assessment. Recommendations are made for a case management program using family nurse practitioners for CHF patients as well as other chronic diseases.

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Congestive heart failure (CHF) is a significant health problem in the U.S. There are over 2 million Americans diagnosed with CHF, with 200,000 CHF related deaths every year. A CHF Comprehensive Care Program in a Northern California medical center began in August, 1997 to case manage and educate CHF patients and their family members. The program adjusted CHF patients' medication with individual treatment plans. The program educated CHF patients to self -manage the chronic condition by daily weight, low sodium diet, medication adherence, activity and rest balance, and daily exercise. This study used a one group, pre and post test study design to evaluate the effectiveness of the CHF program. The results showed statistically significant improvement in three functional health status measures, using the New York Heart Association Classification, Duke Activity Status Index, and 6 Minute Walk Assessment. Recommendations are made for a case management program using family nurse practitioners for CHF patients as well as other chronic diseases.

Keyword: Congestive heart failure (CHF); CHF program; functional health status.

1 Introduction

Congestive heart failure (CHF) is a significant health problem in the United States. Over two million Americans are now living with the diagnosis of heart failure, including 400,000 new cases each year. There are approximately 200,000 CHF related deaths in the U.S., and about one million people are hospitalized with CHF every year. The cost for these hospitalizations is estimated at over seven million dollars annually. The total treatment and medication cost for heart failure in the U. S. was over 10 billion dollars in 1995 [1].

In 1995, a large health maintenance organization (HMO) in Northern California identified 15,000 patients with the diagnosis of CHF. There were 3,952 hospitalizations for the principal condition of CHF, and 2,755 hospitalizations for CHF associated conditions. The cost for the care was $59,476,854 in 1995 [2]. One of the HMO medical centers started a CHF Comprehensive Care Program in August, 1997 to case manage CHF patients. The team consists of a cardiologist and a nurse case manager who is also a second year family nurse practitioner (FNP) graduate student. The program adjusts the CHF medications, orders appropriate tests and procedures, and makes necessary referrals to other health care disciplines such as nutritional consultation. The program teaches the CHF patients and family members to self-manage this chronic condition, and attempts to improve their quality of life. The program monitors the CHF patients by follow-up telephone contacts and office visits.

This CHF program was based on the Stanford Cardiac Rehabilitation Program [3], which used Bandura's social learning theory [4] to guide the coronary risk factor reduction and management of heart failure patients. In the Stanford program, a nurse managed CHF patients by using frequent telephone contact with patients to optimize therapy, improve adherence, and monitor clinical status. This program suggested that the willingness to change to healthier

behavior related to self-efficacy and self-confidence. "Self-efficacy allows for the development of targeted interventions to enhance patient confidence and subsequent adherence to therapies in those patients with poor compliance" [3]. The Stanford program suggested that any heart failure case management program should enhance patient confidence in self-care, monitoring of CHF signs and symptoms, as well as adherence to medication, diet, and exercise.

Block et al. [5] created a CHF management program in a Boston community hospital. They emphasized that education was the core of their program. They formed a multidisciplinary team to provide education on adherence to medication and other treatment regimens. These authors measured success of the CHF program by reducing the cost of CHF disease management, and improving the patient's perception of well-being and quality of life.

Ball and Peruzzi evaluated the outcomes of a CHF case management program in a community hospital in upstate New York. They used the Health Status SF-36 to measure the patient perception of physical limitations, social interactions, and emotional well-being. They found an overall improvement in all three variables after case managing the CHF patients [6].

Venner and Seelbinder emphasized the team management of CHF with other health care disciplines [7]. With the team management approach, a clinical pathway for CHF was developed, and the continuum of care for heart failure was coordinated including hospital, out patient clinic, and the patient's home. Meanwhile, Venner and Seelbinder acknowledged the positive outcomes of functional capacity changes, patient self-care knowledge, and patient satisfaction from the CHF clinical pathway.

The U. S. Department of Health and Human Services Heart Failure Management Guidelines [1] recommended that CHF patients and family members be informed about the diagnosis, the signs and symptoms, and the prognosis of their heart failure. Patients also needed

to know the benefits of regular exercise and eating a low sodium diet, as well as the importance of adherence to medications and other regimens. Moreover, the guideline encouraged regular walking and cycling for stable heart failure patients. It stated regular exercise could improve functional status and decrease heart failure symptoms.

Exercise was one of the nonpharmacologic interventions in the treatment of heart failure that Sullivan and Hawthorne identified from their studies in the Duke University laboratory [8]. The results suggested that exercise improved mood state, cardiac output, and functional capacity. They also found that the improved patient education and nursing follow-up reduced morbidity. They further stated that it was possible that a combination of strategies, "including moderate exercise, lipid management, and stress reduction therapy may produce beneficial results" [8].

Bittner et al. studied the potential usefulness of the 6 Minute Walk Assessment [9]. They followed a random sample of 898 heart failure patients for 242 days with detailed clinical evaluation including the 6 Minute Walk Assessment. They concluded that the 6-Minute Walk Assessment was a safe and simple clinical tool to predict a CHF patient's morbidity and mortality.

Overall, most of the literature emphasized that case management for CHF patients was a cost-effective method to educate patients, and to improve their quality of life with this chronic condition. In addition, this literature emphasized a balance between activity and rest, in combination with a daily exercise regimen, to maximize the CHF patients' functional capacity.

2. Conceptual framework

The conceptual framework influencing this study was Albert Bandura's social-cognitive theory. Bandura defined the social cognitive learning as "the information we process from observing other people, things, and events influences the way we act." Bandura also combined

both cognitive and behavioral elements in his explanation of motivation. He stated that observation of a model could produce significant behavioral changes. Furthermore, he believed that "self-knowledge is gained from information conveyed by either personal or socially mediated experiences" [10].

Bandura emphasized the influential role played by cognitive, modeling and self-regulatory processes in human motivation and action. He stated that, "it is easier to change people's beliefs about the causes of troublesome behavior than it is to change their troublesome behavior" [4]. Bandura emphasized that social-cognitive theory involves an interaction of thought and other personal factors such as behavior and environment. Therapeutic programs based on this theory can include psychosocial, behavioral, and skill components in dealing with situational demands [4].

West et al. [3] acknowledged in the heart failure program training manual that;

> Social learning theory is a comprehensive analysis of human functioning in which human behavior is assumed to be developed and maintained on the basis of three interacting systems; the behavioral, cognitive, and environmental systems. Social-cognitive learning theory emphasizes the human capacity for self-directed behavioral change[3].

3. Methodology

This was a one group, pre-experimental study to answer the question, "does the CHF program improve patient's functional health status?" This study used the pre-test, intervention, and post-test research design. The independent variable was the Northern California HMO's CHF program; and the dependent variable was functional health status. The setting was a HMO medical center cardiology clinic. The data were collected from patients' chart and the CHF program's documentation system. There were 44 patients enrolled into the program from August

to December of 1997. Of these 44 patients, two patients died from the complication of CHF, and four patients moved out of the area. The 20 research subjects were randomly selected from the remaining 38 patients in the CHF program. All subjects were diagnosed with CHF, left ventricular systolic dysfunction, and were enrolled in the program for at least 3 months.

Functional health status was measured by two instruments and one activity observation. These measurement tools have been commonly used in similar studies, and are believed to be valid measures of CHF patients' functional health status [2, 6, 9, 11]. The New York Heart Association (NYHA) functional classification measures the level of activity or exertion which would cause symptoms of shortness of breath and fatigue in a CHF patient. The ratings range from Class I (no symptoms) to Class IV (symptomatic while at rest). The Duke Activity Status Index (DASI) asks whether a CHF patient was able to perform 12 specific activities in the past week at the time of the assessment. It contains 12 questions relating to a CHF patient's activities of daily living. The 6 Minute Walk Assessment is a simple assessment tool to record the CHF patient's ability to walk with or without dyspnea. The CHF program case manager assesses the CHF patient walking in a pre-measured clinic hallway. The distance the patient walks and any exertional dyspnea or increasing shortness of breath is then documented.

The subject's functional health status was recorded at the time of enrollment to the CHF program, followed by at least 3 months of the program's case management and educational intervention, and a post-test measure of functional health status.

The CHF program case management and intervention included:

1. teaching signs and symptoms of CHF and the importance of recording daily weights;
2. adjusting CHF medication according patient's CHF status by titrating diuretics, optimizing CHF medication dosage, and adding new CHF medication;

3. teaching CHF medication actions, side-effects, and medication adherence;
4. teaching low sodium diet, and 2 liters total fluids restriction when taking diuretics;
5. teaching activity and rest balance, daily walking, and exercise;
6. teaching coping skills while living with chronic illness.

The research subjects also were followed closely with telephone calls, laboratory tests, and clinical visits by the nurse case manager. They were referred to nutritional service for diet consultation, to the cardiac support group to enhance coping skills, as well as necessary cardiac testing and procedures in order to achieve a more effective CHF management.

4. Results

The 20 subjects included in this study were 13 males and 7 females. Their ages ranged from 42 to 92 years old with the mean age of 65 years. Results suggest an improvement in functional health status as the result of the CHF program intervention. The New York Heart Association (NYHA) functional classification showed improvement in all categories. Class I (no symptoms) improved from 4 to 9 patients; Class II (symptoms with ordinary activity) improved from 9 to 11 patients; Class III (symptoms with minimal activity) improved from 6 patients to none; and Class IV (symptoms while at rest) also improved from one patient to none (Table 1).

Functional health status was also measured by the Duke Activity Status Index (DASI) with higher scores indicating the ability to do more activities. The DASI score ranged from 7 to 46 in pre-test, and 10 to 52 in post-test. The DASI mean was improved from 16.6 to 22.7, a 36.5% improvement in the CHF patients' activity level (Table 2). A paired sample 2-tailed t test found a statistically significant difference between pre and post test scores ($t = 4.9, p = .000$).

The third measure of functional health status was the 6 Minute Walk Assessment which also showed improvement. The distance of the 6 minute walk pre-test ranged from 200 to 1,200

feet, in which 12 patients had symptoms of dyspnea on exertion during their walking. The post-test walking distance range was 500 to 1,500 feet with no complaints of dyspnea. Table 3 showed that the pre-test mean was 687.5 feet, and the post-test mean was 1,092.5 feet, which demonstrated a 58.9% improvement in walking distance, and a statistically significant difference using a paired sample 2-tailed t test ($t = 6.7, p = .000$). More importantly, there was no complaint of dyspnea on exertion while patients were able to walk a longer distance. This also suggested that the program was effective in teaching the CHF patients how to exercise appropriately, and when to slow down or stop exercise, as well as gradually increasing walking distance.

5. Discussion

This study showed that a CHF case management program can markedly improve patients' functional health status, and improve their quality of life by educating patients about daily weight, low sodium diet, medication adherence, and regular exercise. After the program intervention, patients improved their functional health status, were able to monitor and minimize their CHF symptoms, and to increase their activity level, walking longer distances without dyspnea and fatigue.

The study was limited by design and samples. The lack of a control group precludes comparison with similar patients who were not enrolled in the program. Such similar patients might be able to improve their functional health status even though they were not enrolled into the CHF program. This study evaluated only 3 months of the program intervention. The long term effectiveness of the CHF program in improving CHF patient's functional health status, and its effect on mortality would need further study. Moreover, the subjects may not be

representative of the population as a whole due to the self-selection of HMO users. The results should not be generalized outside of this study.

The scope of nursing practice is clearly defined in American Nurses Association (ANA)'s Nursing's Social Policy Statement [12]. The registered nurse (R.N.) practices basic nursing care for patients and families in varied settings. The R.N. can initiate treatments or carry out interventions prescribed by advanced practice registered nurses or other licensed health care providers to promote health and prevent illness. In contrast, a family nurse practitioner (FNP) is one of the advanced practice registered nurses who has "acquired the knowledge base and practice experiences to prepare them for specialization, expansion, and advancement in practice" [12]. The scope of advanced nursing practice is distinguished based upon the expanding role and the specific field of nursing practice. Nurse practitioners may be working in a primary care clinic setting, in a community or the in-patient care hospital settings. ANA states that;

> The advanced practice registered nurse works with individuals, families, groups, and communities to assess health needs; develop diagnoses; plan, implement and manage care; and evaluate outcomes of care. Within their specialty areas,... may also plan and advocate care that promotes health and prevents disease and disability; direct care or manage systems of care for complex patient/family/community populations; manage acute and chronic illness,... and prescribe, administer, and evaluate pharmacological treatment regimens" [12].

A family nurse practitioner (FNP) is recommended as the CHF program case manager, because of the advanced assessment and nursing practice skills, as well as the ability to diagnose common illnesses and treat stable chronic diseases. Most of the CHF patients have other chronic illness or multiple-organ failures. A FNP will be able to perform a comprehensive physical

examination on CHF patients, and order appropriate diagnostic tests or procedures in a timely fashion as well as making individualized treatment care plans. Moreover, a FNP has medication furnishing authority in all of the states in the U.S. Using a FNP as program case manager will make the CHF medication adjustment and management more efficient and convenient, resulting in more effective patient management than using a R. N. as case manager.

In summary, results suggest case managing a CHF patient population in a HMO setting will improve patients' functional health status. A CHF case management program coordinated by nurse practitioners is an effective way to improve patients' functional health status. This model may also be effective for case management of other chronic diseases in today's health care industry.

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Table 1
Functional Health Status Improvement (New York Heart Association)

NYHA Classification	shortness of breath or fatigue	Pre-test	Post-test
I	no symptoms with ordinary activity	4	9
II	symptoms with ordinary activity	9	11
III	symptoms with minimal activity	6	0
IV	symptoms at rest	1	0

Note: N = 20

Table 2
Functional Health Status Improvement (Duke Activity Status Index)

	N	Mean (S.D.)	Standard error	*t*	*p value*
Pre-test	20	16.6 (9.08)	1.24	4.9	0.000
Post-test	20	22.7 (9.85)			

Note: Paired sample 2-tailed *t* test was used.

Table 3
Functional Health Status Improvement (6 Minute Walk Assessment)

	N	Range (feet)	Mean (S.D.)	Standard error	*t*	*p value*
Pre-test distance	20	200-1,200	687.5 (268.5)	60.14	6.7	0.000
Post-test distance	20	500-1,500	1,092.5 (282.9)			

Note: Paired sample 2-tailed *t* test was used.