Theory-guided interventions for adaptation to heart failure

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Abstract

Title. Theory-guided interventions for adaptation to heart failure

Aim. This paper is a report of a study to examine the effects of a Roy Adaptation Model-based experimental education, exercise and social support programme on adaptation in persons with heart failure.

Background. In the past 20 years, a large number of studies have evaluated heart failure. Several studies of other chronic diseases have been based on the Roy Adaptation Model and show that this approach is useful in promoting adaptation for patients.

Method. A randomized, parallel, controlled clinical trial was conducted in 2005 with 43 patients (21 intervention and 22 control patients). A booklet for patient training was given to those in the intervention group. Participants received a patient identification form, assessment form for physiological data, the Minnesota Living with Heart Failure Questionnaire, Interpersonal Support Evaluation List and the 6-Minute Walk Test.

Results. Patients in the intervention group adapted well to their condition and the four adaptive modes of Roy Adaptation Model were interrelated. Patients’ quality of life was enhanced, their functional capacities increased and social support within the interdependence dimension improved in patients in the intervention group.

Conclusion. This is the first study to use the Roy Adaptation Model in a study of patients with heart failure. Roy’s model is an effective guide for nursing practice when caring for patients with heart failure.

Keywords: 6-Minute Walk Test, heart failure, Interpersonal Support Evaluation List, intervention study, Minnesota Living with Heart Failure Questionnaire, nursing, Roy Adaptation Model

Introduction

Heart failure (HF) is an increasingly common health problem with high morbidity and mortality and numerous hospitalizations (Braunwald et al. 2001, Lainscak & Keber 2003, Vavouranakis et al. 2003). Nearly 5 million Americans have HF [American Collage of Cardiology/American Heart Association (ACC/AHA) Practice Guidelines 2005, Washburn et al. 2005], and data from the Framingham database suggest that 550,000 new cases are diagnosed each year (Miller & Missow 2001). HF is primarily a condition of older people and thus the widely recognized ageing of the population also contributes to its increasing incidence. The incidence of HF approaches 10 per 1000 population after age 65 years (ACC/AHA Practice Guidelines 2005). Approximately 50% of patients aged 65 years and older with HF are readmitted within 6 months of discharge from hospital (Washburn et al. 2005). In addition, there are more than 900,000
hospitalizations in the USA each year because of HF (Rhodes 
& Bowles 2002). The European Society of Cardiology (ESC),
representing countries with a total population of over 900 million, suggests that there are at least 10 million patients
with HF in those countries. Half of patients with a diagnosis
of HF will die within 4 years, and more than 50% of those
with severe HF will die within 1 year (ESC Guideline 2005).

Background
In the past 20 years, there has been a large number of studies
evaluating HF management. Research results were summar-
ized in evidence-based guidelines by the Agency for Health
Care Policy and Research, now called Agency for Health
Care Policy and Research and Quality (AHRQ), the ACC/ 
AHA and the Heart Failure Society of America. Since the
widespread publication of these guidelines, advances have
been made in the provision of evidence-based HF manage-
ment (Washburn et al. 2005). Multidisciplinary cardiac 
rehabilitation programmes that include patient education,
exercise training, and lifestyle modification can improve
symptoms, functional performance and health-related quality
of life (QOL) in older patients with HF (Gary et al. 2004, 
Austin et al. 2005).

Vavouranakis et al. (2003) found that intensive home care 
of patients with HF resulted in improved QOL and reduced 
hospital readmission rates. Studies have shown that patients
with HF had poor understanding of the importance of 
compliance and self-management strategies to optimize
control of the condition (Wright et al. 2003). Multidisciplin-
ary and transitional care models with strong patient educa-
tional components have been effective in reducing hospitalizations and improving QOL among patients
with HF (ACC/AHA Heart Failure Clinical Data Standards 2005).

Patient education is vital for comprehensive HF manage-
ment. Nurses have an important role in educating and
supporting patients with HF to comply with the medical
regimen and practice self-care (Strömberg et al. 1999). A 
team-based approach to patient education and patient
empowerment has been advocated by the AHRQ, ACC/
AHA. Martensson et al. (1998) found that when primary 
healthcare nurses received a patient’s report with information
on the patient’s mental, physical and social status, nurses
could contribute to creating a safe and secure environment
for the patient. Nurses achieved this by increasing the quality
of the family’s emotional support through information and
continuous contact (Hanna & Roy 2001).

Cardiac rehabilitation through physical activity end exercise
training is an important aspect of care for patients with
HF. Physical activity improves exercise tolerance, functional
capacity, and psychological well-being. Rehabilitative exercise
also reduces the severity of symptoms, which can in turn
decrease depression (Artinian et al. 2003). In studying the
management of HF, Gottlieb et al. (1999) and McKelvie et al.
(2002) found that exercise increased 6-minute walking
distance, but QOL was not improved.

A clear and comprehensive plan is needed for optimal 
patient education. The AHRQ guidelines identified six
important topic areas for HF education: the progression of
HF, prognosis, activity, diet, medications, and compliance
with the treatment plan. As patients and caregivers gain
knowledge in these areas and participate in management
decisions, they are empowered to self-manage the illness
(Washburn et al. 2005).

Non-pharmacological advice is an important aspect of
disease management and is included in recently published
ESC guidelines (Lainscak & Keber 2003). The development
of HF clinics, HF units and HF programmes, most of which
are nurse-led, has increased in developed countries with
success (Gonzales et al. 2005). Moreover, observational
studies and randomized controlled trials have shown that
disease-management programmes can reduce the frequency
of hospitalization and can improve QOL and functional
status. Patients at high risk for clinical deterioration or
hospitalization are likely to benefit from disease management
programmes; such interventions are shown to be cost-
effective for this patient group (D’Alto et al. 2003, Wright
et al. 2003, Shievelv et al. 2005).

Corvera et al. (2004) found that a progressive home walking exercise programme for patients with HF is accept-
able, increases walking distance, and decreases global rating 
of symptoms. Compared with the usual activity groups the
training group had significantly longer walking distances
measured by the 6-minute walking test (6MWT) and
improved postglobal rating of symptoms.

Social, physical, emotional and economic difficulties
resulting from chronic disease make it difficult for the patient
and the family to adapt to new conditions; these difficulties
are associated with decreased QOL (Tokem et al. 1999). Heo
et al. (2005) could not demonstrate any association between
social support and QOL. There are too few studies investigat-
ging the relationship between social support and QOL in
patients with HF. In those rare studies, while some research-
ers stated the presence of the association between emotional
support and QOL, others stated a completely opposite view
(Moser & Worster 2000, Bosson 2005).

The focus of the current article is use of the Roy
Adaptation Model (RAM) in the context of cardiac nursing
(Patton 2004) There are no reports of previous studies in
which the RAM was used to offer care to patients with HF.
Research by DiMattio and Tulman (2003) used the RAM to guide a study of women’s functional recovery during the first 6 weeks at home following coronary artery bypass graft surgery. Functional recovery was measured in terms of performance of usual role activities, and the influence of comorbidity, household composition, fatigue and surgical pain on performance. Several studies on different chronic diseases have been based on RAM and similar results have been found. Burns (2004) studied the physical and psychological adaptation of participants of African origin to haemodialysis and found an association between the problems perceived through role performance and social support dimensions of RAM. In a training programme designed to prevent amputation in patients with diabetes, Scollan-Koliopoulos (2004) compared the RAM and the Health Belief Model, and found that the RAM was a better instrument for designing a community-based plan.

Previous studies have found support for the proposition that all modes of adaptation (physiologic, self-concept, interdependence, role function) were interrelated. The RAM is generally used to assess cancer patients. However, study results reveal that severity of illness and adjuvant cancer treatment had the strongest association with bio-psycho-social responses and should be considered the focal environmental stimuli in determining adaptation (Samarel et al. 1998, 2002, Nuamah et al. 1999). Villareal (2003) found that, in caring for a small group of female smokers, the RAM can be used as a guide to provide comprehensive nursing care.

Conceptual framework

The study was guided by the RAM (Figure 1), which is based on scientific assumptions drawn from general system theory (Whittemore & Roy 2002) and adaptation level theory (Whittemore & Roy 2002, Tsai et al. 2003). The RAM focuses on environmental stimuli and the bio-psycho-social responses to the stimuli (Shin et al. 2006), and emphasizes the interaction between the person and the environment as the person adapts to environmental stimuli (Tourville & Ingals 2003). The RAM is one of the most fully developed and widely used of all nursing conceptual models (Riehl & Roy 1980, Veliog˘lu 1999). Nurses act to promote patients’ levels of adaptation during health and illness using the nursing process (Dixon 1999, Villareal 2003, Patton 2004). Environmental stimuli include focal, contextual and residual stimuli (Samarel et al. 1998, Willoughby et al. 2000, Hanna & Roy

![Figure 1 Conceptual–theoretical–empirical structure of adaptation to heart failure. MLWHF, Minnesota Living With Heart Failure Questionnaire; ISEL, Interpersonal Support Evaluation List; 6MWT, 6-minute walking test.](image-url)
et al. (2004). The focal stimulus is the one most immediately confronting the person. Contextual stimuli are all other stimuli that contribute directly to adaptation. Residual stimuli are other unknown factors that may contribute to adaptation. When residual stimuli are identified, they are reclassified as focal or contextual stimuli (Tolson & McIntosh 1996, Gagliardi 2003, Tsai 2005). In the current study, the experimental adaptation programme, social support, age, gender and disease severity were the environmental stimuli of interest. When individuals are confronted with stimuli, their coping processes, by way of regulator and cognitive subsystems, are activated and manifested in one or more of Roy’s four interrelated modes (Cunningham 2002, Gagliardi et al. 2002, Tourville & Íngals 2003).

The physiologic mode relates to maintenance of the physiologic integrity of the adaptive system. The self-concept mode relates to people’s conceptions of their physical and personal selves. The interdependence mode deals with social support and maintenance of satisfying relationships with significant others. The role function mode deals with social integrity by focusing on activities associated with the person’s roles in life (Pearson et al. 1998, Nuamah et al. 1999, Chiu 2001, Yeh 2002, Burns 2004). Adaptive responses promote integrity and help to meet the goals of adaptation, which include mastery, survival and growth. On the other hand, the reproduction of ineffective responses does not promote integrity of the individual and does not contribute to the goals of adaptation (Cunningham 2002).

The study

Aim

The aim of this RAM-based study was to examine the effects of a Roy Adaptation Model-based experimental education, exercise and social support programme on adaptation in persons with heart failure.

Design

The data reported in this paper are a secondary analysis of data from a randomized controlled trial conducted in the first 6 months in 2005. The secondary analysis was carried out at the end of 2005.

Participants

The study was conducted at a cardiology and internal disease polyclinic in a state hospital in Turkey. The 44 patients who participated in the study were randomized to the study conditions: 22 patients to intervention group and 22 patients to control group. Of those randomized to intervention, 21 completed 3 months of follow-up. One patient who had to leave the city during the study period was dropped from the study.

Inclusion criteria for participants were literacy, ability to communicate verbally, diagnosis of HF at least 6 months before for the study, New York Heart Association (NYHA) functional class II–III (Table 1), ejection fraction < 40%, no hearing or visual detect, no mental disorder, no myocardial infarction in the past year, and plans to remain in the city during the study period or could be reached by telephone.
The Interpersonal Support Evaluation List (Owen 2003) is a 48-item Interpersonal Support Evaluation List (ISEL) designed by Owen (2003). The interdependence mode of adaptation was measured with the ISEL. This measure assesses the perceived availability of the following specific support resources. The instrument consists of three subscales: tangible support, appraisal support and belonging support. Each item is endorsed on a rating scale with the following response options: completely false, somewhat true and completely true. Negatively phrased items on each scale are reverse scored so that higher scores reflect greater perceived availability of the specific support resource reflected in each subscale and for the total score (Owen 2003). Cronbach’s α coefficient in the present study was 0.79.

6-Minute walking test
Functional status was measured using the 6MWT. After 6 minutes elapsed, patients were instructed to stop walking and the total distance walked was measured to the nearest foot. Before and after each 6MWT the patient’s pulse, respiratory rate and blood pressure were recorded (McKelvie et al. 2002, Duncan & Rozehl 2003). Physical symptoms observed by the investigator or reported by the participants, and the latest 6-minute walk test results were recorded (Gary et al. 2004). Physiologic mode of adaptation was measured using the 6MWT.

Table 1 New York Heart Association (NYHA) classification of heart failure

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Diagnosed with heart failure based on cardiac changes, but no symptoms present regardless of level of activity</td>
</tr>
<tr>
<td>II</td>
<td>Symptoms (such as fatigue, dyspnoea, palpitations, angina) with ordinary activity; slight activity limitation</td>
</tr>
<tr>
<td>III</td>
<td>Symptoms with less than ordinary activity; no symptoms when at rest; marked limitation with daily tasks</td>
</tr>
<tr>
<td>IV</td>
<td>Symptoms with any type of physical activity, or even at rest</td>
</tr>
</tbody>
</table>

Instruments

**Patient identification form**
An investigator-developed questionnaire was used to collect demographic information for each patient.

**Assessment form for physiological data**
An assessment form was prepared to evaluate changes in body mass index (BMI), cholesterol, high-density lipoprotein (HDL) and low-density lipoprotein (LDL) levels; to determine changes in habits such as smoking, alcohol consumption, adaptation to diet and regular medication use; and to find out the number of hospital admissions because of HF during the programme.

**Minnesota Living With Heart Failure Questionnaire (MLWHF)**
The latent variable, QOL, was measured using the MLWHF questionnaire at baseline and at 3 months. Patients indicated their perspective concerning disability using 21 items on a 6-point response scale (0–5), with a maximum score of 105. Lower scores indicate better QOL (Artinian et al. 2003). The instrument consist of three separate scale scores: physical (eight items), emotional (five items) and total score (Riegel et al. 2002, Heo et al. 2005). The questions cover signs and symptoms relevant to HF and their impact on physical activity, social interaction, sexual activity, work and emotions (Duncan & Rozehl 2003). The physiologic mode was measured with the physical subscale of the MLWHFQ, the emotional subscale of the MLWHFQ was used in order to measure the self-concept mode, and role function mode of adaptation was measured by the other items on the MLWHF questionnaire. In the present study, Cronbach’s α coefficient was 0.83 for the total score, 0.87 for the physical dimension and 0.61 for the emotional dimension.

**Interpersonal Support Evaluation List (ISEL) – short form**
The Interpersonal Support Evaluation List (Owen 2003) is a 15-item measure of perceived social support derived from the

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education materials taught patients to recognize the symptoms of HF and to contact the investigator and medical staff if early sign or symptoms of worsening HF occurred.

The investigator provided additional information to the patient based on the patient’s interest in specific topics or questions raised during the session. Patients were encouraged...
to engage in regular exercise and advised that it is safe to exercise up to the level of moderate discomfort (e.g. fatigue of the leg muscles, dyspnoea or angina). No adverse event occurred throughout the duration of exercise regimen. Self-monitoring techniques (e.g. recording daily weight) and positive verbal feedback were also part of the intervention. One-on-one interviews were 2 hours in length. Measures of 6MWT, MLHFQ, ISEL-SF and blood testing for levels of cholesterol, HDL, LDL were chosen to reflect the impact of the intervention and were applied to both intervention and control group patients at baseline and at 3 months. The interview consisted of establishing specific goals with patients related to healthier diet, increased quality and amount of exercise and increased social and interpersonal activities. The focus of the interview was on goal setting and individualizing health life-style changes for participants. Advice was reinforced at each subsequent clinic visit during one-on-one counselling sessions by the investigator.

Telephone contacts were made to verify functional status, proper use of medications and to encourage the patients to adhere to the programme. Patients were also instructed to call the investigator to report symptoms or any other problem promptly.

A group education session was offered at 1 month. This session included explanation of monitoring of daily body weight, plan of action if weight changed, effects of medications, importance of compliance and recommendations regarding exercise and diet. For this purpose, a PowerPoint presentation was given to patients. After this, patients shared their experiences. Some patients participated with their relatives and partners in the group session.

Patients in the control group were instructed to maintain their normal daily activities and clinic visits. At the last one-on-one interview (after 3 months), 6MWT, MLHFQ, ISEL-SF and blood testing were applied to intervention and control groups.

Ethical considerations

The study was approved by the ethics committees of both the state hospital and the university nursing school. Participants gave verbal informed consent to participate. All were given information about opportunities to withdraw from the study and told that there would be no disadvantages if they chose to withdraw from the study.

Data analysis

Data were analysed with SPSS (version 10.0, SPSS Inc., Chicago, IL, USA). Relationships among variables were examined by calculating Pearson correlation coefficients. Between group differences at pretest and post-test were tested using $t$-tests. The chi-squared test was used to test for differences in categorical data. Repeated measures analyses of variance (ANOVA) with post hoc $t$-tests were used to analyse the study hypothesis that patients who participated in the adaptation programme would better adapt to living with the HF than those who were assigned to the control condition. Statistical significance was set at $P = 0.05$ and 0.001.

Results

Table 2 shows baseline clinical details of the randomized patients. There was no baseline difference between the intervention and control groups concerning education level, age, and sex and NYHA class. Mean age of patients in the intervention group was 62.67 years; 61.9% were female and 52.4% were married. At least 20% of the patients were

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intervention n = 21 (%)</th>
<th>Control n = 22 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NYHA class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NYHA II</td>
<td>14 (66.7)</td>
<td>13 (59.1)</td>
</tr>
<tr>
<td>NYHA III</td>
<td>7 (33.3)</td>
<td>9 (40.9)</td>
</tr>
<tr>
<td>Age group (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30–39</td>
<td>1 (4.8)</td>
<td>1 (4.5)</td>
</tr>
<tr>
<td>40–49</td>
<td>1 (4.8)</td>
<td>1 (4.5)</td>
</tr>
<tr>
<td>50–59</td>
<td>8 (38.1)</td>
<td>6 (27.3)</td>
</tr>
<tr>
<td>≤60</td>
<td>11 (52.4)</td>
<td>14 (63.6)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>8 (38.1)</td>
<td>9 (40.9)</td>
</tr>
<tr>
<td>Female</td>
<td>13 (61.9)</td>
<td>13 (59.1)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literate/primary school</td>
<td>10 (47.6)</td>
<td>11 (50.0)</td>
</tr>
<tr>
<td>Middle school</td>
<td>6 (28.6)</td>
<td>7 (31.8)</td>
</tr>
<tr>
<td>High school</td>
<td>3 (14.3)</td>
<td>3 (13.6)</td>
</tr>
<tr>
<td>University</td>
<td>2 (9.5)</td>
<td>1 (4.5)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>11 (52.4)</td>
<td>14 (63.6)</td>
</tr>
<tr>
<td>Widowed/divorced</td>
<td>10 (47.6)</td>
<td>8 (36.4)</td>
</tr>
<tr>
<td>Way of life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lives alone</td>
<td>4 (19.0)</td>
<td>5 (22.7)</td>
</tr>
<tr>
<td>Lives with spouse</td>
<td>6 (28.6)</td>
<td>11 (50.0)</td>
</tr>
<tr>
<td>Children, spouse</td>
<td>4 (19.0)</td>
<td>3 (13.6)</td>
</tr>
<tr>
<td>Lives with children</td>
<td>7 (33.3)</td>
<td>3 (13.6)</td>
</tr>
<tr>
<td>Drugs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACE inhibitor</td>
<td>17 (28.3)</td>
<td>16 (23.8)</td>
</tr>
<tr>
<td>β-Blocker</td>
<td>6 (10.0)</td>
<td>6 (9.0)</td>
</tr>
<tr>
<td>Diuretic</td>
<td>7 (11.7)</td>
<td>8 (11.9)</td>
</tr>
<tr>
<td>Digitalis</td>
<td>– (–)</td>
<td>4 (6.0)</td>
</tr>
<tr>
<td>Anticoagulant</td>
<td>18 (30.0)</td>
<td>17 (25.49)</td>
</tr>
<tr>
<td>Other</td>
<td>12 (20.0)</td>
<td>16 (23.9)</td>
</tr>
</tbody>
</table>
taking an angiotensin-converting enzyme inhibitor (10% β-blocker and 10% diuretic).

There was no inter-group difference in baseline QOL data. Intervention patients showed statistically significantly improved scores on the MLWHF, physical dimension and emotional dimension (Figures 3, 4 and 5) over time compared with control patients. There was no statistically significant baseline difference for 6-minute walk distance between the control (376 ± 52.77 m) and intervention groups (383 ± 52.44 m). There was a statistically significant increase in 6-minute walk distance compared with baseline at 3 months for intervention (46.19 m) group. There was a statistically significant decrease in 6-minute walk distance compared with baseline at 3 months for the control group (5.82 m) (Figure 6). There was no group difference in baseline data for social support. Intervention patients showed a statistically significantly improved ISEL-SF total score and over time compared with control patients. Differences between mean scores of cholesterol and LDL levels of the patients in the intervention group were statistically significant from baseline to 3 months, but no statistically significant difference was found for the control group for these dimensions. The difference between the mean HDL levels of the two groups was not statistically significant from baseline to 3 months of follow-up (Table 3).

There was a positive association between total MLWHF score and its physiologic, emotional and role performance sub-dimensions. There was a negative relationship between MLWHF, ISEL-SF and the 6-MWT scores: as the score on the MLWHF questionnaire decreased, scores on ISEL-SF and 6-MWT increased. There was a positive association between the physiologic dimension of MLWHF questionnaire and emotional function, role performance and total score of MLWHF questionnaire. There were negative associations between the Social Support Scale and 6-MWT; between the Social Support Scale and the physiologic sub-dimension of QOL and total score of QOL; and between and physiologic, emotional, role performance and total score of the QOL scale. However, there was a positive association between scores for the 6MWT and the Social Support Scale; between cholesterol level and LDL level and BMI; and between BMI and LDL level (Table 4).

Discussion

Study limitations

This study has several limitations. Exclusion criteria limited the number of patients participating. No power calculation was carried out as this was a secondary data analysis and
hence only variables in the original study were available, which limited the possibility of operationalizing some concepts. In addition, use of a convenience sample limited the generalizability of the findings. Further, although the findings provide preliminary evidence of causal relationship among variables, better examination of causality will require longitudinal data. On the other hand, these study findings could be culturally specific and the study would need to be replicated in different cultural settings.

**Discussion of results**

Intervention and control group differences for QOL, walk distance and social support quality indicate that the RAM-based adaptation programme had some effect on adaptation to HF in relation to physiologic, self-concept, interdependence and role function modes.

Exercise in management of HF has been studied extensively. The Clinical Practice Guidelines on HF recommended regular exercise in NYHA classes I-III for patients with HF. This recommendation was based on several studies which showed that patients with HF could exercise safely, improve their functional status, and decrease symptoms (DeWald et al. 2004). In the current study, the improvement in distance walked at 3 months in the intervention group is equivalent to an improvement in functional performance, the consequence of which is enhanced daily activity. The finding that there was a significant improvement in the 6MWT is agreement with other studies (Gottlieb et al. 1999, Gary et al. 2004, Austin et al. 2005). Corvera et al. (2004) found that patients in the training group who improved had remarkably increased 6MWT distances. These findings suggest that a simple walking programme is beneficial for many patients with HF and can result in increased walking distances in some patients.

McKelvie et al. (2002) found that a comprehensive HF management programme led to improved functional status and an 85% decrease in hospital admission rate for heart transplant candidates. A study by Vavouranakis et al. (2003), which examined a similar cohort of patients, found fewer hospitalizations and increased exercise capacity when patients were managed with a dedicated HF programme (Vavouranakis et al. 2003).

Comprehensive HF programmes that include patient education, self-management strategies and integrated follow-up by a multidisciplinary team, show benefits in term of improved patient QOL and fewer hospitalizations (Wright et al. 2003, Lainscak 2004). Previous research has shown that exercise and education improves QOL in some, but not all, studies of HF (Artinian et al. 2003, Vavouranakis et al. 2003, Corvera et al. 2004, Gary et al. 2004, Shievelv et al. 2005). Austin et al. (2005) reported significant differences in all MLWHF components (emotional, physical and total) between experimental and standard-care patients at 8 and 24 weeks. Investigating which components have the greatest uptake by patients would help in the formulation of guidelines for the streamlined design of patient self-management programmes for HF (Wright et al. 2003).

DeWald et al. (2004) developed and tested an educational programme designed to meet the needs of patients with low literacy skills. Participants (n = 23) showed a significant improvement in HRQOL that is likely to be of clinical importance. Disease management programmes have a positive effect on patient outcomes and are associated with decreased hospitalizations and readmissions (DeWald & Gaulden 2000). The findings from the current study suggest that the adaptation programme used is particularly effective at improving HRQOL, as described by disease-specific and utility measures, than a nurse-led outpatient clinic.

There have been few studies of the effects of exercise on QOL. However, most of the available studies demonstrate an improvement in the QOL of patients with HF after an exercise programme. In the current study, the significant improvement in QOL which is included in the physiologic dimension of the RAM is also believed to be associated with the exercise programme. Shievelv et al. (2005) found that intervention patients showed significantly improved MLWHF physical dimension scores over time compared with control.

### Table 3 Social support and blood test results

<table>
<thead>
<tr>
<th></th>
<th>Intervention (n = 21)</th>
<th>Control (n = 22)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline, mean (SD)</td>
<td>3 months, mean (SD)</td>
</tr>
<tr>
<td>Social Support</td>
<td>42 (3-12) *</td>
<td>47 (3-12) *</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>199 (32-73) *</td>
<td>179 (39-71) *</td>
</tr>
<tr>
<td>HDL</td>
<td>41 (4-69)</td>
<td>41 (4-40)</td>
</tr>
<tr>
<td>LDL</td>
<td>138 (36-75) *</td>
<td>28 (27-05) *</td>
</tr>
</tbody>
</table>

HDL, high-density lipoprotein; LDL, low-density lipoprotein.

*P < 0.05.
Table 4 Correlations between measures

<table>
<thead>
<tr>
<th>Physical MLWH</th>
<th>Emotional MLWH</th>
<th>Role Function MLWH</th>
<th>Tangible Support ISEL</th>
<th>Appraisal Support ISEL</th>
<th>Belonging Support ISEL</th>
<th>6MWT</th>
<th>Cholesterol</th>
<th>HDL</th>
<th>LDL</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLWHF</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional MLWHF</td>
<td>0.562**</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role Function MLWHF</td>
<td>0.404**</td>
<td>0.327**</td>
<td>1.000</td>
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<tr>
<td>MLWHF</td>
<td>0.884**</td>
<td>0.739**</td>
<td>0.722**</td>
<td>1.000</td>
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<tr>
<td>Tangible support ISEL</td>
<td>-0.470**</td>
<td>-0.212</td>
<td>0.066</td>
<td>-0.298</td>
<td>1.000</td>
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<tr>
<td>Appraisal support ISEL</td>
<td>-0.350**</td>
<td>-0.124</td>
<td>0.119</td>
<td>-0.184</td>
<td>0.564**</td>
<td>1.000</td>
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<tr>
<td>Belonging support ISEL</td>
<td>-0.514**</td>
<td>-0.249</td>
<td>-0.221</td>
<td>-0.448**</td>
<td>0.583**</td>
<td>0.405**</td>
<td>1.000</td>
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<tr>
<td>ISEL</td>
<td>-0.522**</td>
<td>-0.225</td>
<td>0.027</td>
<td>-0.346**</td>
<td>0.894**</td>
<td>0.830**</td>
<td>0.730**</td>
<td>1.000</td>
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<tr>
<td>6MWT</td>
<td>-0.741**</td>
<td>-0.700**</td>
<td>-0.413**</td>
<td>-0.782**</td>
<td>0.468**</td>
<td>0.305**</td>
<td>0.530**</td>
<td>0.505**</td>
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<tr>
<td>Cholesterol</td>
<td>0.00</td>
<td>0.038</td>
<td>-0.197</td>
<td>-0.068</td>
<td>-0.190</td>
<td>0.299</td>
<td>-0.107</td>
<td>0.013</td>
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<tr>
<td>HDL</td>
<td>-0.271</td>
<td>-0.255</td>
<td>-0.157</td>
<td>-0.289</td>
<td>0.105</td>
<td>0.277</td>
<td>0.190</td>
<td>0.225</td>
<td>0.228</td>
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</tr>
<tr>
<td>LDL</td>
<td>-0.161</td>
<td>-0.031</td>
<td>-0.255</td>
<td>-0.201</td>
<td>-0.228</td>
<td>0.230</td>
<td>-0.003</td>
<td>-0.009</td>
<td>0.225</td>
<td>0.824**</td>
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<tr>
<td>BMI</td>
<td>-0.027</td>
<td>-0.179</td>
<td>-0.238</td>
<td>-0.163</td>
<td>0.100</td>
<td>0.398**</td>
<td>-0.118</td>
<td>0.191</td>
<td>0.136</td>
<td>0.435**</td>
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</table>

MLWHF, Minnesota Living With Heart Failure Questionnaire; ISEL, Interpersonal Support Evaluation List; 6MWT, 6-minute walking test; HDL, high-density lipoprotein; LDL, low-density lipoprotein; BMI, body mass index.

*P < 0.05, **P < 0.001.
What is already known about this topic

- The Roy Adaptation Model has been used to guide research conducted in various settings and with various populations, but has not been used to guide studies of patients with heart failure.
- Several rehabilitation programmes for patients with heart failure have had positive effects on quality of life and functional abilities.
- The Roy Adaptation Model is an appropriate guide when providing nursing care for patients with chronic diseases such as heart failure.

What this paper adds

- Patients in the intervention group adapted well to their condition and the four adaptive modes of Roy Adaptation Model were interrelated. Patients’ quality of life was enhanced, their functional capacities increased and social support within the interdependence dimension improved in patients in the intervention group.
- At the end of the rehabilitation programme there were statistically significant improvements in patients’ quality of life, functional abilities, social support, physiological findings and emotional status.
- Roy’s model is an effective guide for nursing practice when caring for patients with heart failure.

Conclusion

This is the first study of the RAM being used to study patients with HF. The RAM can be used in adaptation programmes to guide evaluation of the process of adaptation. The adaptation modes of the RAM may be useful to all health educators and are not limited in scope to nursing practice. The RAM is an effective guide for nursing practice when caring for clients with HF. The current researchers argue that there is strong evidence of increased exercise capability after exercise adaptation programmes. Such programmes need to be tailored to individuals.

Future RAM-based experimental studies should include larger samples. Intervention research is needed to determine behaviour-change strategies that will assist patients in adopting more effective ways of coping with HF. Educational programmes should focus on providing patients with the incentives, knowledge and skills necessary to carry out these health-related behaviours. Additional research is warranted on the impact of family structure on patients’ health.

Future studies are needed in which a comprehensive measure of social support is used to determine the relationship between social support and HRQOL in patients with HF. The authors believe that adaptation should become an important concept in the care of patients who have experienced HF. It appears that the model used in the current study has the potential to be generalized to other areas of nursing practice, education and research. Intensive management in HF clinics can be effective in translating clinical guidelines into practice.

Acknowledgements

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Author contributions

GB and AA were responsible for the study conception and design and the drafting of the manuscript. GB performed the data collection and GB and AA performed the data analysis. GB provided administrative support. GB and AA made critical revisions to the paper. GB and AA provided statistical expertise. GB and AA supervised the study.

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ACC/AHA Heart Failure Clinical Data Standarts (2005) ACC/0041HA key data elements and definitions for measuring the clinical management and outcomes of patients with chronic heart failure. Journal of the American Collage of Cardiology 46(6), 1179–1207.


