CLINICAL STUDY

# Investigating the effectiveness of self-management program based on 5A model on fatigue and dyspnea in patients with heart failure

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**ABSTRACT**

BACKGROUND: Some symptoms such as fatigue and dyspnea decrease the quality of life in patients with heart failure. The effectiveness of self-management programs on management of chronic conditions was discussed. So, this study aimed to investigate the effectiveness of self-management program based on 5A model on fatigue and dyspnea in patients with heart failure.

METHODS: In this clinical trial study, 60 patients with heart failure were included. The intervention group underwent self-management program based on 5A model and the control group received routine care. All the enrolled patients were evaluated once at baseline and once after 3 months using fatigue severity and Borg dyspnea scales. The obtained data were analyzed using SPSS software version 16 by descriptive statistics and independent t-test, covariance test, and paired sample t- test. The significance level was set at 0.05.

RESULTS: There was no significant difference in the mean scores of fatigue and dyspnea at the beginning of the study between control and intervention groups (p > 0.05), but 3 months after intervention a significant difference was found in mean scores of fatigue and dyspnea between two groups, (p < 0.05). The difference between pre- and post-intervention scores in terms of the dyspnea and fatigue variables was significant based on the result of paired sample t-test (p < 0.05).

CONCLUSION: According to the results of this study, self-management program based on 5A Model can be used to reduce the severity of fatigue and dyspnea as well as improve the quality of life in patients with heart failure *(Tab. 4, Fig. 1, Ref. 33)*. Text in PDF *www.elis.sk*

KEY WORDS: dyspnea, fatigue, heart failure, 5A self-management model, self-management.

## Introduction

Heart failure (HF) is one of the most common cardiovascular disorders, which is chronic, progressive, and debilitating (1). Therefore, in this disease, following the weakness of the heart muscle due to myocardial infarction, cardiomyopathy or valvular heart diseases, the heart is unable to meet all the body's metabolic needs (2). USA statistics showed an increasing trend in the number of patients with HF, as about 5 million people are currently living with the disease and more than 150000 new cases are diagnosed each year (3). Statistics in Iran also showed a high rate of the incidence of HF, as the number of patients were estimated to be about 3500 per 100000 (4).

The chronic, progressive and debilitating nature of this disease causes chronic symptoms such as: dyspnea, fatigue, confusion, weakness, pulmonary and limbs edema, chest pain and palpitation (5). Dyspnea as one of the most common symptoms in these patients, could reduce their quality of life (6). Accordingly, dyspnea is a mental sensation of hard breathing (7), which occurs during activities (exertional dyspnea) in patients under primary heart conditions and as the disease is progressing, dyspnea can be seen with milder activities and may eventually occur even at the time of rest (orthopnea) (8). Another common symptom in patients with HF is fatigue, which is described as a mental sensation of exhaustion and lack of energy. In addition, it is a multidimensional sense influenced by various physical, psychological, and social factors (9).

Physicians prescribe some medications to control these symptoms, but interventions such as self-management programs besides pharmacological treatments are mostly used to control the symptoms and improve the quality of life of patients with HF (10). Self-management programs provide strategies for treatment of chronic health conditions, in which the patients play a pivotal role in promoting their health, preventing the disease, and successful control of the disease (11). In a self-management program, care and treatment activities are performed by focusing on patients and with the aim of achieving the maximum independence, self-determination, health

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promotion based on abilities and lifestyle, and increasing the quality of life (12). Meanwhile, 5A self-management model, as a habit change counseling is an evidence-based approach, appropriate for habit modification and health care, which includes the following five stages: Assess, Advise, Agree, Assist, and Arrange, that run during three months (13). This model was firstly developed by Glasgow and it has been used by health care providers on a number of occasions, including habits change and smoking cessation counseling (14).

Mulder et al (2015) in their study used 5A self-management model for counseling and habits changing in patients with type two diabetes and their results showed that this model can improve physical activity and eating habits of the patients (15). Heidari et al (2015) in their clinical study evaluated the effectiveness of 5A model on 50 patients with COPD, and the results showed the reduction in dyspnea and fatigue (16). In another study, some positive effects of using 5A model on providing some advice for obesity patients in primary care level were reported (17). A positive effect of this model was also reported on behaviors like smoking (18).

According to the emphasis of the above-mentioned studies on the positive effects of this model on self-management, symptom control and changing unhealthy behaviors under chronic conditions, considering the high prevalence of HF and due to the limited number of studies performed on controlling symptoms of chronic disease like HF, further studies on the use of 5A self-management program are necessary.

**Objectives of the study**

The primary goal of the present study was to evaluate the effectiveness of self-management program based on 5A model on common disabling symptoms in patients with HF. As the fatigue and dyspnea are two common symptoms in these patients, so the Secondary objectives of this study were: investigating the effectiveness of self-management program based on 5A model, on fatigue in patients with HF as well as investigating the effectiveness of this model on dyspnea in mentioned patients.

We anticipate that the self-management program based on 5A model will reduce the chronic symptoms of patients with HF and consequently increase their quality of life. Furthermore, we expect that this intervention will be cost-effective with reducing hospital readmission rates.

**Materials and methods**

*Study design*

The study was a randomized, single -blinded clinical trial with control and intervention groups. The aim of this trial was to investigate the effectiveness of self-management program based on 5A model on fatigue and dyspnea in patients with HF.

After obtaining the study approval (97000789) from the research council of Kerman University of Medical Science on 4 Feb 2019, obtaining ethics code IR.KMU.REC.1397.479 of ethics committee of Kerman University of medical science, registering clinical trial on 11/Aug/2019, with Trial registration number of: IRCT20141109019862N8 as well as receiving a written informed consent from all participants, the researcher registered the patients admitted in CCU of Srijan's (a city in Iran) hospitals in the study.

*Sample size determination*

According to a similar article (16) and using the sample size formula (considering the probable drop out of the participants), 60 HF patients who met the inclusion criteria were finally included in the study using convenience sampling.

$$n = \frac{(z_{1-\frac{\alpha}{2}} + z_{1-B})^2 (d_1^2 + d_2^2)}{(\mu_1 - \mu_2)^2} = \frac{(1/96 + 1/28)^2 (7/16^2 + 6/57^2)}{(34/4 - 41)^2} = 23$$

*Study population and eligibility*

The study population consisted of the patients with HF who were admitted in the cardiac units of Srijan's hospitals. The inclusion criteria were as follows: age above 18 years, being conscious, no acute respiratory infection or other respiratory diseases such as chronic obstructive pulmonary disease (COPD), and desire to participate in this study. The exclusion criteria were as follows: exacerbation of patient's condition and not attending the training sessions.

*Randomization*

After explaining the purpose of the research to the participants, if they wanted to participate, they were added to the list of participants. After registration of all participants, they were randomly assigned to the intervention and control groups through the simple random sampling method, (30 patients in each group). Sampling was done from 30 September 2019 to 1 January 2020.

The patients in the control group received routine care, but the intervention group received a self-management program based on 5A model in addition to their routine care (Fig. 1).
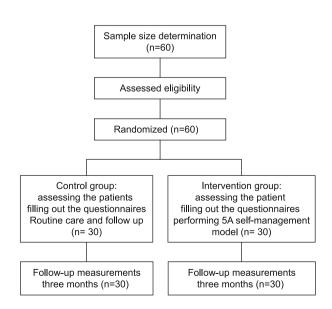


Fig. 1. The flow diagram of the study.

*Routine care*

Patients in the control group received standard care only. Standard care consisted of medication, monitoring and general education about diet, rest and activity and next visits, without any follow-up program.

*Intervention*

After stabilizing the acute condition of patient, the intervention was performed in the 5 following stages during 3 months from 10 January 2020 until the 11th of April 2020. The first stage (assess): assessing patients' knowledge, life-styles, and health beliefs, as well as reviewing patients' medical history, assessing the symptoms related to their heart condition such as; dyspnea, fatigue, drugs side effects and required pharmacological knowledge, sleep status, nutrition, activity tolerance, and beliefs related to the disease and treatment. The second stage (advice): providing some advices about health risk factors and benefits of changing unhealthy life-styles, at this stage, according to the assessment results, health risks were identified for each patient and nursing diagnosis was written and reported to the patient. The third stage (agree): a written agreement was reached between the patient and the researcher on the patient's performance (agreed with the patient upon realistic goal setting). Thus, according to each nursing diagnosis, appropriate and agreed behavioral objectives were identified and an action plan was designed for each objective. The first three steps were performed in a session which lasted an hour and a half for each participant. The fourth stage (assist): assistance in developing a practical plan, three 2-hour training sessions were held in small groups consisting of five participants (considering common problems of the individuals) during 6 weeks to inform the patients about their disease. Training lectures, face to face consulting and group discussions according to the nursing diagnoses and objectives were held, also some educational brochures along with motivational programs such as walking exercise were presented. Some of the educational contents were as follows: training about diet, how to take drugs and manage their side effects and choose proper activity and exercises due to the patients' needs and how to manage it according to heart disease. The fifth stage (arrange a follow up plan): at this stage, telephone calls were made in the first two weeks daily and then weekly, up to three months for following the patient's performance.

*Data collection*

The following instruments were used for data collecting:

1) a questionnaire on personal information, including age, sex, marital status, educational level, income, employment status, insurance status, and place of residence; in addition information related to the participant medical history such as: reasons for referring to the hospital, suffering from other chronic disease, duration of the HF, history of taking a particular medication, family history, history of smoking and regular opium use gained through interviewing patients.

2) Fatigue severity scale (FSS): this is a valid self-reported scale designed by Krupp et al (1989) to measure fatigue in patients with multiple sclerosis and Lupus (19). In Iran, A'zimiyan et al

(2010) determined reliability of the instrument through test-retest (r = 0/93) and Cronbach's alpha as 0.96 (20). This scale includes 9 items, each one of which is scored in a Likert spectrum of zero to 7. Accordingly, zero score means strongly disagree and score 7 means strongly agree. The total score was obtained from the sum of scores, which would be between 0 and 63, and if a patient achieved a score equal or higher than 36, it would show that person had fatigue, so the higher the score, the more severe the fatigue.

3) Borg dyspnea scale: this is a standard numerical scale designed by Pfeiffer et al in 2002 to examine patients' dyspnea at the times of resting and doing activities (21). Correspondingly, its reliability has been calculated to be 0.78 based on Cronbach's alpha (21). Scores would be between zero (no dyspnea) and ten (maximum dyspnea), during rest and physical activity separately.

At first, personal information questionnaire was completed through interview and physical examination, the degree of HF checked out by reviewing the patients' medical documents, intensity of dyspnea and fatigue of all of participants were assessed using fatigue severity scale (FSS) and Borg's dyspnea scale, when the patients were not at the acute condition of disease. Then, after performing the self- management program, the patients in both control and intervention groups also were assessed using FSS and Borg dyspnea scale.

*Statistical analyses*

Data were analyzed using SPSS software version 16. Demographic variables were analyzed by descriptive statistics (mean ± SD, frequency and percentage), the compression of medical history of patients in control and intervention groups was conducted using Chi-square.

Paired t-test, independent t-test, and covariance were used to assess the intervention effect on the mean score of fatigue and dyspnea severity. The significance level was set to 0.05.

**Results**

In this study, 60 patients (30 in the intervention group and 30 in the control group) with mean age of 64.63 ± 2.19 years in the control group and 65.26 ± 1.93 years in the intervention group participated. The two groups had equal demographic features, but they were significantly different in opium use, so that 63 % of control group and 30 % of intervention group had opium use (p < 0.05). Participants' medical histories in both groups were also compared, which is presented in Table 1.

In this study, all the participants were in the second or third stages of HF and suffered from dyspnea and fatigue. All of them experienced exertional dyspnea and dyspnea which occurs during milder activities and even at rest.

In order to determine and compare the mean score of fatigue and dyspnea severity (during rest and activity) between control and intervention groups before the intervention, independent t-test was used (Tab. 2).

As the results show, there weren't any significant differences between the mean scores of variables between control and intervention groups before intervention (p > 0.05).

**Tab. 1. Comparison of medical history of patients in control and intervention groups.**

| Variable | | Control | | Intervention | | Test statistics | p |
|---|---|---|---|---|---|---|---|
| | | frequency | percent | frequency | percent | | |
| Reasons for referring to the hospital | dyspnea and chest pain | 6 | 20 | 5 | 16.66 | 0.29 | 0.89 |
| | dyspnea, chest pain, high blood pressure, and fatigue | 12 | 40 | 11 | 36.67 | | |
| | dyspnea, chest pain, high blood pressure, fatigue and edema | 12 | 40 | 14 | 46.67 | | |
| History of other chronic disease | musculoskeletal disorders, diabetes, hypertension and visual disturbances | 20 | 66.67 | 15 | 50 | 1.71 | 0.19 |
| | Musculoskeletal disorders, hypertension, visual disturbances and kidney disease | 10 | 33.33 | 15 | 50 | | |
| History of taking a particular medication for… | cardiac, diabetes, hyperlipidemia and neurological medication | 5 | 16.67 | 10 | 33.33 | 2.22 | 0.14 |
| | cardiac, diabetes and hyperlipidemia medication | 25 | 83.33 | 20 | 66.67 | | |
| Family history | Hypertension | 12 | 40 | 13 | 43.34 | 0.11 | 0.95 |
| | Diabetes | 8 | 26.67 | 7 | 23.33 | | |
| | Coronary artery disease | 10 | 33.33 | 10 | 33.33 | | |
| History of smoking | Yes | 12 | 40 | 7 | 23.33 | 1.92 | 0.16 |
| | No | 18 | 60 | 23 | 76.67 | | |
| Regular opium use | yes | 19 | 63.33 | 9 | 30 | 6.69 | 0.01* |
| | No | 11 | 26.67 | 21 | 70 | | |
| Duration of heart failure | Less than three years | 4 | 13.33 | 11 | 36.67 | 4.42 | 0.11 |
| | 3–5 years | 12 | 40 | 8 | 26.66 | | |
| | More than 5 years | 14 | 46.67 | 11 | 36.67 | | |
| Heart failure stage | grade 2 | 22 | 73.33 | 27 | 90 | 1.92 | 0.09 |
| | grade 3 | 8 | 26.66 | 3 | 10 | | |

**Tab. 2. Determinig and comparing mean scores of resting and exertional dyspnea and fatigue severity between two groups before intervention.**

| Variable | Groups | Mean±SD | Test statistics | p |
|---|---|---|---|---|
| Fatigue severity | Control | 49.43±0.89 | −0.87 | 0.39 |
| | Intervention | 50.63±1.04 | | |
| Resting Dyspnea | Control | 1.66±0.26 | 2.01 | 0.49 |
| | Intervention | 1.35±0.15 | | |
| Exertional dyspnea | Control | 4.66±0.34 | −1.62 | 0.11 |
| | Intervention | 5.46±0.35 | | |

However, after performing the intervention, covariance test was used with controlling the effect of opium and pre-test on results, to determine and compare the mean score of resting and exertional dyspnea and fatigue severity between control and intervention groups, the results are presented in Table 3.

According to the results there were significant differences between the mean scores of variables between control and intervention groups after intervention (p ≤ 0.001)

Additionally, paired t-test was used to evaluate changes in scores of resting and exertional dyspnea and fatigue severity, before and after the intervention, in both groups separately, the results are presented in Table 4.

As the results show there weren't any significant differences between mean scores of main variables (resting and exertional dyspnea and fatigue severity) before and after intervention in control group (p > 0.05), but these differences were significant in intervention group before and after intervention (p ≤ 0.001).

## Discussion

In this study, we examined the impact of using 5A self-management model on fatigue and dyspnea in patients with chronic HF. According to the results, 5A self- management model was found to have a positive effect on reducing fatigue and dyspnea in patients with HF. The results of Heidari et al's study (2014) have also shown that applying 5A self-management model has a positive effect on fatigue severity and dyspnea in patients with chronic obstructive pulmonary disease (16). Accordingly, fatigue and dyspnea are the two most common complaints in patients under chronic conditions such as HF, that effect their quality of life (22). The results of the present study showed that this model is not only effective on reducing exertional dyspnea, but it can also be effective on decreasing resting dyspnea. Numerous studies have examined the effects of various non-pharmacological treatments on decreasing dyspnea. In this regard, Beniaminovitz et al (2002) found that strengthening legs muscles reduce fatigue and dyspnea in HF disease (23). The impact of muscles training was also reported on increasing functional status of chronic HF patients (24). Therefore, the positive effect of non-pharmacological treatments can be acknowledged, so based on the results of this study and those of some other studies, it can be said that by applying self-management techniques, patients can overcome disease

**Tab. 3. Comparison of mean scores of resting and exertional dyspnea and fatigue sevrity between two groups after intervention with controling confounders.**

| Variable | DF | Mean of squares | Test statistics | p |
|---|---|---|---|---|
| Addiction (opium) | 1 | 0.07 | 0.35 | 0.55 |
| Resting dyspnea (before intervention) | 1 | 50.29 | 251.44 | 0.001 |
| Group (intervention/control) | 1 | 7.48 | 37.40 | 0.001* |
| error | 56 | 0.2 | | |
| Addiction (opium) | 1 | 0.85 | 1.43 | 0.24 |
| Exertional dyspnea (before intervention) | 1 | 81.48 | 137.05 | 0.001 |
| Group (control/intervention) | 1 | 94.61 | 159.13 | 0.001* |
| error | 56 | 0.59 | | |
| Addiction (opium) | 1 | 31.44 | 2.96 | 0.091 |
| Fatigue before intervention | 1 | 266.41 | 25.11 | 0.001 |
| Group(control/intervention) | 1 | 6570.12 | 619.36 | 0.001* |
| Error | 56 | 10.6 | | |

**Tab. 4. Determining and comparing mean scores of resting and exertional dyspnea and fatigue severity before and after intervention in each group separately.**

| Group | Variable | Time | Mean±SD | Test statistics | p |
|---|---|---|---|---|---|
| Control group | Fatigue severity | Before intervention | 49.43±0.89 | –0.89 | 0.39 |
| | | After intervention | 49.60±0.81 | | |
| | Resting dyspnea | Before intervention | 1.66±0.26 | 1 | 0.33 |
| | | After intervention | 1.63±0.26 | | |
| | Exertional dyspnea | Before intervention | 4.66±0.34 | –0/63 | 0.54 |
| | | After intervention | 4.73±0.33 | | |
| Intervention group | Fatigue severity | Before intervention | 50.63±1.04 | 19.14 | 0.001* |
| | | After intervention | 28.26±0.59 | | |
| | Resting dyspnea | Before intervention | 1.05±0.15 | 5.20 | 0.001* |
| | | After intervention | 0.40±0.05 | | |
| | Exertional dyspnea | Before intervention | 5.46±0.35 | 12.22 | 0.001* |
| | | After intervention | 2.41±0.14 | | |

complications (16). Wongpiriyayothar et al (2011) mentioned the positive effect of training patients and follow up by phone call on reducing dyspnea and improving physical function of patients with HF(25). As mentioned previously, the fifth step of 5A model is following up patients, that its effectiveness was mentioned in Wongpiriyayother's study too.

Moreover, this study also found that using 5A self-management model has a positive effect on fatigue of chronic HF patients. Fatigue is a common symptom of chronic condition such as HF, and it is mostly related to the reduced blood and oxygen uptakes by the tissues (8, 26), which consequently affects patients' independence and quality of life. Various studies based on self-management models have been done to control fatigue symptoms in patients. Roozitalab et al in their study (2020) stated a significantly positive effect of 5A self-management model on fatigue in cancer patients undergoing chemotherapy immediately and 3 month after the end of the intervention (27). Accordingly, this result was in line with the findings of the present study, confirming the impact of 5A self-management model on fatigue. Although few studies have examined the effects of this care model, but similar self-management models showed their positive effects in this context. Wang et al in 2015 stated positive effects of supportive nursing care on fatigue and quality of life of HF patients (28). In addition,

some other studies stated positive effects of applying respiration muscles training on fatigue and quality of life of patients with HF (29, 30, 31). Furthermore, Masoudi et al (2018) in a study pointed to a significant inverse relationship between fatigue and general self-care abilities and also between fatigue and self-care capacity (32). In most of the above-mentioned studies, the effect of a single intervention on controlling symptoms has been investigated, whereas in the comprehensive 5A self-management model, after assessment of the patient a specific plan is designed for each patient with involving the patient and his family, then some trainings and consultation are provided according to patients' needs, their personal characteristics, beliefs, and abilities, afterwards this participatory program would be followed by a nurse, which will be more successful (33).

## Conclusion

In chronic diseases like HF, some existing complications such as fatigue and dyspnea affect patients' performance. Self-management programs enable patients to rely on their abilities, gain sufficient knowledge about their disease and control the related symptoms and problems. Therefore, self-management and self-care models, especially 5A model, play effective roles in better controlling these symptoms, reducing the related complications, enhancing nursing care and improving patients' quality of life. Another purpose of using self-management model is active participation of patients for managing their disease, rather than complete dependency on care providers.

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