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Effect of Home-Based Cardiac Rehabilitation Program on Self-Efficacy of Patients With Implantable Cardioverter Defibrillator

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Abstract

Introduction: For more effective control and treatment of cardiac dysrhythmias caused by diseases, ischemia, or other causes, an implantable cardioverter defibrillator (ICD) is used. One of the effective ways for secondary prevention is the home-based cardiac rehabilitation (HBCR) which nurses have an effective role in its implementation.

Objective: The study aimed to investigate the effect of implementing HBCR programs on the self-efficacy of patients with ICD.

Methods: This is a semi-experimental study conducted on 70 patients who received ICD in Shahid Chamran Heart Center of Isfahan University of Medical Sciences (IUMS) in 2021. The patients were randomly assigned to intervention and control groups and were introduced to the practical concepts of HBCR during four training sessions. In the following, 3-month follow-up and trainings were continued by home visits, telephone follow-up, and use of social messaging networks due to the conditions of coronavirus disease 2019 (COVID-19) pandemic. The data were analyzed with SPSS/21.

Results: The findings showed that performing HBCR programs was effective in improving the self-efficacy of patients with ICDs. A significant trend in the implementation of the HBCR programs in two groups was shown using chi-square test and independent *t*-test and variance with repeated measurements ($p < .001$). There was no significant difference in self-efficacy score in both groups at the beginning of the study ($p < .056$).

Conclusion: Considering the effectiveness of HBCR programs on improving the self-efficacy of patients with ICDs, it can be used in the educational care programs of healthcare workers and in the strategic policies of health care services.

Keywords

cardiac rehabilitation, implantable cardiac defibrillator, self-efficacy, heart diseases

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Introduction

Cardiovascular diseases (CVD) are one of the most prevalent non-communicable disease causes of death globally, such as Iran (Avazeh et al., 2015; WHO, 2011), as some 17 million people die due to the CVD. Statistics show that about 25% of these cases are due to sudden cardiac arrest (SCA) (Berna & Sıdıka, 2018). According to predictions, the rate of mortality due to CVD would increase from 17 million deaths in 2008 to 25 million in 2030 (Wang et al., 2016). Patients with CVD have a high risk of adverse cardiovascular complications, such as fatal and nonfatal myocardial infarction (MI). Consequently, CVD is also the leading cause of disability, rating for 10% of disability-adjusted life years (DALY) lost worldwide (Turk-Adawi et al., 2014).

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According to the statistics of the Ministry of Health and Medical Education (MOHME) of Iran, CVD are still the leading cause of mortality and disability caused by diseases since the last 30 years, as in 2020, for every 100,000 people, 277 Iranians died due to CVD (Avazeh et al., 2015). One of the main causes of SCA is ventricular dysrhythmias, which is responsible for 65%–85% of the causes of this disease (Avazeh et al., 2015). SCA occurs due to ischemic diseases or any other cause due to life-threatening arrhythmias, including ventricular fibrillation and any other dangerous arrhythmia, which could be prevented with an implantable cardioverter defibrillator (ICD) device (Josephson & Wellens, 2004).

Although the implantable ICD is the most effective method of treating dysrhythmias, ICD candidates face concerns and challenges due to the insertion of a foreign body into the heart (Duru et al., 2001; Ketilsdottir et al., 2014). Among these concerns, we might mention disruption in daily life and self-efficacy, lack of life control, disruption in social communication and physical activity, social isolation and changing in social roles (Berna & Sıdıka, 2018; Humphreys et al., 2016).

Self-efficacy is one of the humanity concepts introduced by Bandura. Negative emotions such as fear, tension, and depression cause people to underestimate their abilities in performing tasks, which is associated with a decrease in self-efficacy and might lead to patient stress and anxiety (Bandura, 2009). A person's self-efficacy is a strong determinant of their effort, persistence, strategizing, as well as their subsequent training and job performance. Moreover, the power of self-efficacy causes the initiation and maintenance of health behaviors and it is a very important variable in changing the behavior and attitude of patient who participate in the rehabilitation program (Brink et al., 2012; Hacıhasanoğlu et al., 2012). Self-efficacy in dealing with chronic disease is not simply a matter of knowing what to do. It reflects a capability to organize and integrate cognitive, social, and behavioral skills to meet a variety of objectives. Mechanism for coping with challenges posed by chronic disease requires not only knowledge and skills but also a belief in one's ability to use those skills in realistic contexts and a belief that the use of the skills will produce desired outcomes (Dougherty et al., 2007).

According to the statement of the American Heart Association (AHA) published on May 19, 2019, among the components of home-based cardiac rehabilitation (HBCR), we can mention exercises with the aim of physical activity of patients, diet training with the aim of healthy eating, medication management, and smoking cessation training and stress management (Thomas et al., 2019). In some studies, 71% of eligible patients were not referred and were, therefore, unable to access to cardiac rehabilitation (CR). Two of the main reason's patients given for not accepting the invitation to attend CR are hardness with regularly attending sessions at their local rehabilitation center and reluctance to take part in group-based classes (Buckley et al., 2013).

HBCR programs have therefore been introduced in an attempt to improve rates of participation. Regarding the principles of HBCR programs, the three categories of respect, support, and participation are the key components of this care method. HBCR program is a concept to health care that recognizes the integral role of the family and encourages mutually beneficial cooperation among the patient, family, and health care team. HBCR program ensures the health and well-being of patients and their families through a respectful family-professional partnership. It honors the strengths, cultures, traditions, and expertise that all members of this partnership bring to the relationship. HBCR program is the standard of practice that results in high-quality services. HBCR program embraces the concepts that, (a) we are providing care for a person, not a condition, (b) the patient is best understood in the context of his or her family, culture, values, and goals, and (c) honoring that context will result in optimal health care, safety, and patient satisfaction (American Academy of Pediatrics, 2006; Dunn et al., 2006). In the UK, HBCR with a self-help manual—the heart manual—supported by a nurse facilitator is a program of CR that has been available for years. HBCR programs can include supervised and unsupervised elements and increasingly use technology or "telehealth" interventions to encourage exercise or behavior change or to overcome barriers of time and distance (Lewin et al., 1992).

Literature Review

Continuous review and standardization of HBCR programs is necessary to care for a wide range of patients and current conditions (Drwal et al., 2020). Jolly et al. in a meta-analytical study on all published articles related to HBCR and specialized CR centers in 2006, indicated that HBCR reduces systolic blood pressure and smoking, and the level of exercise capacity increases significantly (Jolly et al., 2006). In patients for whom an ICD has been implanted, it takes a year to adapt to the new conditions, and the prolongation of this period might increase the feeling of anxiety and depression; therefore, physicians and health programs should encourage patients with ICD to CR program (Davids et al., 2005; Eslamiankoupaie, et al., 2018). The results of several studies have shown that participation in a CR program reduces mortality by up to 25% over an average of 5 years when compared with usual treatment and care, such as medical therapy alone (Alter et al., 2009; Clark et al., 2005; Heran et al., 2011; Jolliffe, 2009; Martin et al., 2012; Taylor et al., 2004).

In Iran too, CR services are rarely provided by centers; on the other hand, the number of patients in hospital CR is low (Turk-Adawi et al., 2014). Consequently, there is a need to teach and guide Iranian CVD patients towards HBCR (Vahedian-Azimi et al., 2016). The CR helps to control the

symptoms of the disease, reducing smoking, improving social psychological health, reducing stress, and improving adaptation and social functioning of patient (Stefanakis et al., 2022). The CR could be done in rehabilitation centers, hospitals, and also at home, which is the superiority of HBCR compared to other places for implementation might be considered for increasing the participation rate, reducing patient and family costs, reducing hospitalization costs, and reducing hospital infections. Also, during the COVID-19 pandemic in 2019, a further gap in CR was created due to the reduced access to services for patients (Stefanakis et al., 2021). During the COVID-19, the value and experiences of home care programs have become more prominent since physicians are looking for methods to continue delivering medical services (de Melo Ghisi et al., 2021; Epstein et al., 2021; Keteyian et al., 2022). A recent study found that 38% of programs were offering some form of home or innovative delivery of CR during the COVID-19 pandemic (American Association of Cardiovascular and Pulmonary Rehabilitation, 2021). In this regard, the intervention group decided to investigate the effect 8 week of HBCR compared with control group on self-efficacy of patients with ICD in Shahid Chamran Heart Center.

Methods

Design and Sample

This semi-experimental study was conducted on 70 patients with cardiac patients with ICD referring to Shahid Chamran Heart Center of IUMS in a period of 6 months in 2021. Patients were selected by convenience sampling method and randomly divided through random allocation into two interventions and control groups. The required sample size is based on the study of Oshvandi et al. (Oshvandi et al., 2014) ($n = 147$). Taking into account the minimum mean difference between two groups of 0.7, type 1 error of 5%, statistical power of 84%, and taking into account the possible dropout of 10% for each group, 35 patients and a total of 70 patients were calculated.

Inclusion/Exclusion Criteria

The criteria for entering the study were informed consent to participate in the study, the patient or his/her main companion is literate, the patient does not have cognitive problems or anxiety disorders that are being treated with drugs, the patient has access to a landline or mobile phone, the patient does not have any physical injury and specific movement limitations, the absence of life-threatening arrhythmias and uncontrolled arrhythmias in the analysis performed after the device is implanted by the attending physician, not suffering from unstable and stable angina and unstable hemodynamic conditions according to the evaluation of the attending physician, and the continuous evaluation and follow-up of the researcher according to the classification of the New York Heart Association (not in classes III and IV), the patient or one of his/her family members does not have medical education, does not have speech and hearing disorders, being over 35 years old and younger than 75 years old, in order to avoid damage and displacement of the ICD leads, one month should have passed since the installation of the Medtronic device. Exclusion criteria also include: the patient's unwillingness to continue participating in the study, hospitalization for any reason, and infection of the device insertion site, stroke or suffering from any type of disease limiting movement during the study.

Data Collection Tools

The data collection tools included demographic information questionnaire, Sullivan cardiac questionnaire, and home visit checklist.

Sullivan Cardiac Self-Efficacy Questionnaire

Sullivan's cardiac self-efficacy questionnaire was designed by Sullivan et al. (1998), and the validity and reliability of its Persian version in CVD patients was reported by Jafari Sejzi et al. (2018). In general, the validity index of the content of this questionnaire was calculated as 91.33%. Cronbach's alpha coefficient calculated for this questionnaire in another study by Varaei et al. was 0.977 (Varaei et al., 2013). This questionnaire has 16 questions evaluating the confidence and self-efficacy of patients in the field of compliance with general care, control of disease symptoms, and adherence to medication orders using a 5-point Likert scale. Each question has four points in which four points are assigned to the highest level of confidence (completely confident) and zero points are assigned to the lowest level of confidence (I am not confident at all). The total score of this questionnaire is between zero and 64, and higher scores indicate better perceived self-efficacy. Scores from 0 to 32 indicate poor cardiac self-efficacy, and scores from 33 to 64 reflect high perceived self-efficacy.

Home Visit Checklist for Patients With CVD

This checklist was created based on the components of the statement of May 19, 2019 of the AHA on HBCR and the review of related texts including six parts of walking control, recognizing and complying with risk factors, complying with medication and food regimen, psychological support, and referring the patient to a specialist if needed.

After sampling, patients were selected by convenience sampling method and randomly divided through random allocation into two interventions ($n = 35$) and control groups ($n = 35$). Patients in the control groups received conventional care programs of the hospital; in the intervention

group, dedicated CR training was done at home in 4 sessions for 30–40 min per week, following the heath guidelines for dealing with the COVID-19. Patients in the control group continued their normal life and did not receive any booklets or pamphlets and did not participate in any classes. The walking program of the patients in the intervention group was started 1 month after ICD implantation in the newly implanted patients, and the walking program protocol was based on the Schwartz heart patient walking program, which is suitable for the low functional level of patients with heart problems. Patients were instructed to count their pulse before, during, and 5 min after walking. It should be noted that the patient should reach his/her maximum heart rate, which is about 60%–80% of the maximum of his/her age; and it is necessary to calculate the maximum heart rate range in these patients to 20 beats of the programmed rate for the ICD device (Borzou et al., 2017) (Table 1).

Data were collected through self-reporting. The content of the training sessions was according to the scientific texts and the indicators of the US Home Rehabilitation Statement in 2019. A nurse trained in the HBCR was selected as a researcher's assistant. After the start of the HBCR by the intervention group, follow-up was done by phone every week at a specific time. Questionnaires previously completed by both groups were re-filled out immediately after the trainings in the presence of the project partner and 3 months after the intervention in the last visit at home. In the control group, patients filled out the questionnaires by visiting the hospital or at home.

Ethical Consideration

The present study was approved by Ethical Committee Medical Sciences University of Shahrekord (ethics code: IR.SKUMS.REC.1399.098). Also, after selecting the eligible patients, the researcher was introduced to them and the objectives of the study were elaborated for the patients. The informed consent was obtained from the patients and they were assured that their information will remain confidential.

Data Analysis

After data collection, descriptive and inferential statistics such as chi-square, independent *t*-test, and analysis of variance as well as SPSS/21 were used to analyze the data. Descriptive statistics describing the existing conditions were used to determine the central and dispersion indicators such as the mean score (MS) and standard deviations (SD) and to set the absolute and relative frequency tables.

Results

Sample Characteristics

The demographic characteristics of the studied patient are shown in Table 2. It is worth mentioning that all the samples in both control and intervention groups had the necessary participation during the study and no patients were excluded from the study (the participation rate was 100%). Chi-square statistical test did not show any significant difference in the distribution of samples in two groups in terms of background variables. The MS and SD of self-efficacy scores at three time points (before, immediately, and 3 months after the intervention) were estimated as: 25.08 ± 4.2, 36.8 ± 9.7, and 38.4 ± 9.8 in the intervention group and 29.02 ± 10.5, 29.3 ± 9.7, and 29.2 ± 29.3 in the control group, respectively.

At the beginning of the study, there was no significant difference between the two groups in terms of self-efficacy

Table 1. Home Visit Checklist for Intervention Group.

Item	Content
Control of patient walking at home	• *Frequency, duration, symptoms during walking and counting the number of pulse beats by the patient.* **Phase I.** Warming up the body, which takes about 5 to 10 min to warm up the body, such as walking or running slowly. **Phase II.** The goal is to reach a maximum heart rate, the phase of aerobic exercise includes walking, cycling, etc. **Phase III.** The body cooling phase after the main exercise activities, the activity should be gradually reduced, because if a person stops suddenly during intense exercise, this condition will increase blood pressure, dizziness, and fainting. This stage consists of walking slowly for about 5 min, and it should be noted that in case of symptoms such as shortness of breath or fatigue, stop the physical activity and rest immediately.
Recognizing and observing cardiovascular risk factors	• *Smoking, anxiety, weight gain and weight gain, etc.*
Knowledge and adherence to medication and diet	• *Medication: Type of medicine, side effects and correct time of use.* • *Diet: Consumption of liquid oil, low salt and low fat and consumption of fresh fruits and vegetables.*
Psychological support for the patient	• *Interviews and guidance on how to adapt to new conditions.*

Table 2. Sample Characteristics.

Variable		Control group		Intervention group		*p*-value
		n	%	*n*	%	
Age	35–45	3	8.6	0	0	.160
	45–55	5	14.3	9	25.7	
	55–65	6	17.1	9	25.7	
	65–75	21	60	17	48.6	
Gender	Female	12	34.3	17	48.6	.227
	Male	23	65.7	18	51.4	
Marital status	Single	0	0	5	14.3	.061
	Married	33	94.3	29	82.8	
	Divorced	2	5.7	1	2.9	
Level of education	Illiterate	6	17.1	2	5.7	.065
	Less than college	15	42.9	8	22.9	
	Diploma	9	25.7	16	45.7	
	College or higher	5	14.3	9	25.7	
Economic status	Poor	2	5.7	0	0	.314
	Medium	15	42.9	18	51.4	
	Good	18	51.4	17	48.6	
Job status	Employee	1	2.9	0	0	.762
	Housewife	2	5.7	17	48.6	
	Worker	2	5.7	9	25.7	
	Self-employment	5	14.3	9	25.7	
	Retired	21	60	0	0	
	Unemployed	4	11.4	0	0	
Having diabetes	Yes	19	54.3	12	34.3	.092
	No	16	45.7	23	65.7	
Having blood pressure	Yes	19	54.3	11	57.1	.053
	No	16	45.7	24	42.9	
History of previous MI	Yes	28	80	26	74.3	.569
	No	7	20	9	25.7	
High cholesterol level	Yes	17	48.6	10	28.6	.086
	No	18	51.4	25	71.4	
Other diseases	Yes	16	45.7	18	51.4	.632
	No	19	54.3	17	48.6	
Severity of heart failure	Class I	24	68.6	17	48.6	.089
	Class II	11	31.4	18	51.4	
Duration of disease	Less than 6 months	3	8.6	11	31.4	.059
	6 months and 1 year	7	20	9	25.7	
	1–3 years	8	22.9	4	11.4	
	3 years ≤	17	48.6	11	31.4	

score ($p = .056$). But immediately and 3 months after the intervention, there was a significant difference in the self-efficacy score between the two groups ($p < .001$). Therefore, the intervention group had a higher self-efficacy score than the control group. In both groups, the self-efficacy score was significantly increased during the study; although, there was a significant difference in the changes of the self-efficacy score in the two groups. The MS changes in the intervention and control groups were increased by 13 and 0.18 units, respectively. The trend of increasing the self-efficacy score was different in the two groups ($p > .001$). In the intervention group, the self-efficacy score increased more and significantly, and in the control group not statistically significant (Table 3 and Figure 1).

Discussion

Patients with ICD experience functional impairment in their lives after the device is implanted. This investigation demonstrates how implementation of a CR program could be useful for these patients. Self-efficacy makes a difference in how patient feel, think, and act. Low self-efficacy is associated with depression, anxiety, and helplessness; on the other hand, patient with high self-efficacy choose more challenging tasks.

Table 3. The Mean Self-Efficacy Score of Patients With ICD.

Self-efficacy	Control group M ± SD	Intervention group M ± SD	*p*-value
Before intervention	29.02 ± 10.5	25.08 ± 4.2	.051
Immediately after the intervention	29.3 ± 9.7	36.8 ± 9.7	>.01
3 months after the intervention	29.9 ± 2.6	38.4 ± 9.8	>.001
Intragroup P	0.275	>0.001	>.001
Changes during the study	−0.22 ± 2.41	−13.34 ± 0.81	>.001

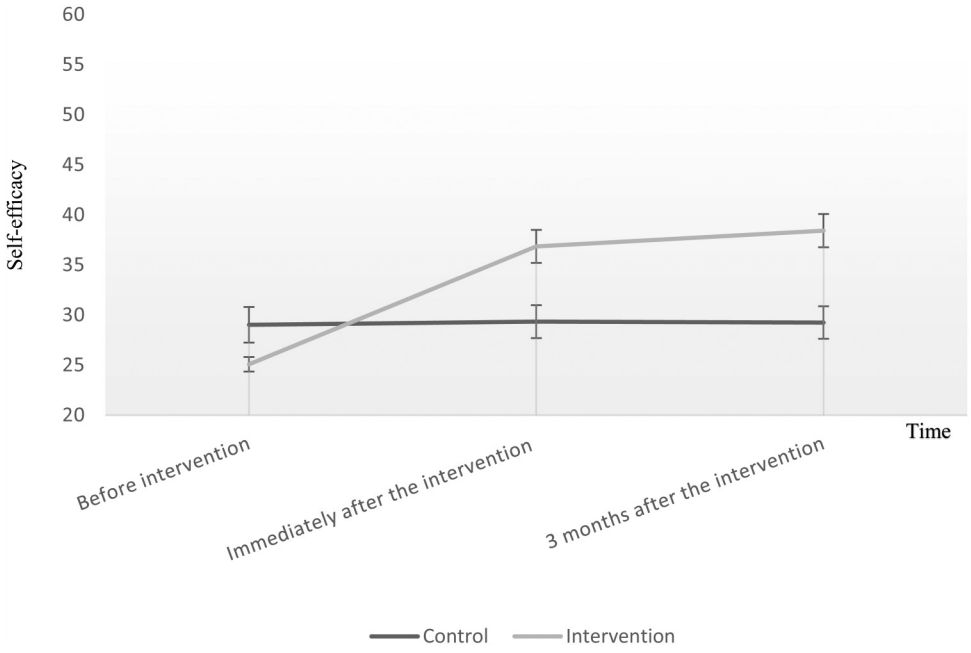

Figure 1. Mean self-efficacy score of patients with ICD during the study in two intervention and control groups (interaction of group and time).

The highest age frequency of the research units was related to an age group of 65–75 years and the lowest frequency percentage was related to the age group of 35–45 years. The minimum age of the study patients was 35 and the maximum was 75 years. There was no significant difference between the mean age obtained in both intervention and control groups. In the study of Golabchi et al., the patients were in the age group of 30–75, and the mean age of the patients was 60.25 years old (Golabchi et al., 2019).

Comparing the changes in the MS of self-efficacy in the control and intervention groups before, immediately and 3 months after the intervention indicated no significant difference in terms of the self-efficacy score ($p = .056$) in both groups at the beginning of the study. However, immediately and 3 months after the intervention, there was a significant difference in the self-efficacy score in the two groups ($p < .001$). Thus, the intervention group had a higher self-efficacy score than the control group. The MS changes in the intervention and control groups increased by 13 and 0.18 units, respectively. It seems that the reason for the difference in the MS self-efficacy in the intervention group immediately and 3 months after the intervention compared to before the intervention was the implementation of the HBCR. In a study by Oshvandi et al., the effect of CR phase-one training on the self-efficacy of men and women undergone heart surgery was postoperatively evaluated.

The results of the aforementioned study were consistent with our study, so that the mean total score of self-efficacy in both male and female groups in two stages during the discharge and the follow-up period (1 month after discharge) compared to before the intervention had a significant increase ($p < .001$) (Oshvandi et al., 2014). In 2019, Golabchi et al. evaluated the effect of group discussion and video training on the stress, depression, and self-efficacy levels of a total of 105 patients with pacemakers and ICD_s. In their study, patients were placed in three groups of 35 patients (group discussion, video, and control). The mean self-efficacy score of patients with ICD_s in the group training and video group ($p = 0.009$) compared to the control group ($p < .001$) had a

statistically significant difference (Golabchi et al., 2019), which is in line with the results of the present study.

The findings of a clinical trial by Wang et al. in China, with the aim of the effect of a HBCR programs on the health-related quality of life (QoL) and mental status of 160 patients recovered from acute MI were also aligned with our research. The group receiving the HBCR obtained a better score in terms of the 36 indicators of the health standard and in terms of multiple scales in heart attacks (Wang et al., 2012). In a semi-experimental study by Mohammadi et al. in Tehran, the implementation of HBCR was effective on the QoL of heart attack patients, and the QoL improved in physical and mental aspects as well ($p = .000$) (Mohammadi et al., 2006). In a similar study, Poortaghi et al. obtained similar results and reported that HBCR has a positive effect on patient self-efficacy. Before beginning the HBCR, there was no difference in the general self-efficacy index between the intervention group (26.3 ± 0.84) and the control group (28.53 ± 0.54) ($p = .44$). After the intervention, the MS of general self-efficacy in the intervention and control groups were reported as 36.59 ± 5.65 and 26.5 ± 0.91, respectively. Furthermore, a significant statistical difference was observed between the two groups ($p = .000$) (Poortaghi et al., 2013). Limoee et al. study showed that the implementation of a HBCR programs increases the QoL of patients after coronary artery bypass surgery (Limoee et al., 2019). Also, the results of a study in the CR center of a hospital in Taiwan showed that early CR after cardiac surgery has significantly improved the physical capacity and QoL of heart transplant patients (Du et al., 2017).

In general, according to our findings and other studies, the HBCR programs and self-care is an individual need. Teaching the principles of self-care helps the patients with an ICD in accordance with the disease, coordinating with the prescribed treatments and learning to solve problems in facing new conditions. The lack of knowledge and awareness of a patient with CVD about how to take care of himself/herself is considered as one of the reasons for re-hospitalization. If it is possible to assign part of the care responsibility to the patient and family by spending time to perform HBCR, the number and time of occupying hospital beds would be reduced and relative recovery would be provided.

Strengths and Limitations of the Study

This research was carried out in the specific conditions of COVID-19; in order to solve this problem, it was tried to do training in the open space with a small number of patient or individually; and also, in the implementation of educational programs in a group, coordination for the formation of classes, and the presence of research units in all classes was one of the basic problems of the researcher; in order to solve this problem, if the research units are not coordinated, the trainings are done individually. Another limitation is that sometimes it was difficult to convince the patients to attend the training classes, and their cooperation was obtained by stating the importance and purpose of the research and telephone follow-ups.

Implications for Practice

Nurses have a vital role in providing care and hygiene services at the home level, which unfortunately, the gap in the health system of our country is quite noticeable. Undoubtedly, nurses trained for CR program could play a pivotal role in the effectiveness and continuity of rehabilitation team services at home for patients with chronic disorders.

Conclusion

This study confirms these previous findings and suggests more efforts are needed to promoting and encouraging as much as possible the use of HBCR for ICD patients. CR is equally effective as more-invasive and expensive interventions for improving self-efficacy and clinical outcomes in low-risk patients. Therefore, as cardiology services are improved in global, CR should be at the forefront of care. The implementation of HBCR is actually a type of implementation of community-based CR programs. These CR programs could solve an important part of patients' problems, such as the distance and dispersion of specialized rehabilitation centers, the unwillingness and acceptance of patients, and the high costs of CR programs in the centers, and also improve the communication between different treatment departments. Creating awareness and commitment to the strict implementation of the CR with the management of health workers might play an effective role in improving the self-efficacy of these patients.

Abbreviations

AHA	american heart association
COVID-19	coronavirus disease 2019
CR	cardiac rehabilitation
CVD	cardiovascular diseases
DALY	disability-adjusted life years
HBCR	home-based cardiac rehabilitation
ICD	implantable cardioverter-defibrillator
MI	myocardial infarction
MOHME	ministry of health and medical education
MS	mean score
QoL	quality of life
SCA	sudden cardiac arrest
SD	standard deviations

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Author Contributions

MH, PNH carried out the data extraction, performed the data analysis and interpretation, and drafted the manuscript. MH, PNH, JM, SK, and AA performed the data analysis and interpretation, and drafted the manuscript, and also conducted the writing and revision of the manuscript. All authors read and approved the final manuscript.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval and Consent to Participate

The present study was approved by Ethical Committee Medical Sciences University of Shahrekord (ethics code: IR.SKUMS.REC.1399.098). Also, after selecting the eligible participant, the researcher was introduced to them and the objectives of the study were elaborated for the participants. The informed consent was obtained from the subjects and they were assured that their information will remain confidential.

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References

Alter, D. A., Oh, P. I., & Chong, A. (2009). Relationship between cardiac rehabilitation and survival after acute cardiac hospitalization within a universal health care system. *European Journal of Cardiovascular Prevention & Rehabilitation*, *16*(1), 102–113. https://doi.org/10.1097/HJR.0b013e328325d662

American Academy of Pediatrics (2006). Patient-and family-centered care and the role of the emergency physician providing care to a child in the emergency department. *Pediatrics*, *118*(5), 2242–2244. https://doi.org/10.1542/peds.2006-2588

American Association of Cardiovascular and Pulmonary Rehabilitation (2021). COVID-19 and Telehealth. https://higherlogicdownload.s3.amazonaws.com/AACVPR/6fd6170d-682c-4fbc-b79c-08e3d62c2526/UploadedImages/COVID-19/AACVPR_COVID-19_Ongoing-Advocacy-for-Telehealth.pdf. Published May18, 2020. Accessed February 26, 2021.

Avazeh, A., Hajiesmaeili, M., Vahedian, A. A., Naderi, A., Madani, S. J., & Asghari, J. M. (2015). Effect of progressive muscle relaxation on patients lifestyle with myocardial infarction: A double-blinded randomized controlled clinical trial. *Knowledge and Health*, *10*(3), 1–8. http://doi.org/ 10.22100/jkh.v10i3.635

Bandura, A. (2009). Cultivate self-efficacy for personal and organizational effectiveness. Retrieved February 24, 2015.

Berna, A., & Sıdıka, O. (2018). Self-Efficacy and shock anxiety state of patients with implantable cardioverter defibrillator. *Clinical and Experimental Health Sciences*, *8*(2), 146–149. https://doi.org/10.5152/clinexphealthsci.2017.595

Borzou, S. R., Amiri, S., Salavati, M., Soltanian, A. R., & Safarpoor, G. (2017). Comparing the effects of education of the first phase of cardiac rehabilitation on self-efficacy of men and women after heart surgery: A clinical trial study. *Iranian Journal of Rehabilitation Research*, *4*(1), 52–58.

Brink, E., Alsén, P., Herlitz, J., Kjellgren, K., & Cliffordson, C. (2012). General self-efficacy and health-related quality of life after myocardial infarction. *Psychology, Health & Medicine*, *17*(3), 346–355. https://doi.org/10.1080/13548506.2011.608807

Buckley, J. P., Furze, G., Doherty, P., Speck, L., Connolly, S., Hinton, S., & Jones, J. L. (2013). BACPR scientific statement: British standards and core components for cardiovascular disease prevention and rehabilitation (Vol. 99, pp. 1069-1071): BMJ Publishing Group Ltd and British Cardiovascular Society.

Clark, A. M., Hartling, L., Vandermeer, B., & McAlister, F. A. (2005). Meta-analysis: Secondary prevention programs for patients with coronary artery disease. *Annals of Internal Medicine*, *143*(9), 659–672. https://doi.org/10.7326/0003-4819-143-9-200511010-00010

Davids, J. S., McPherson, C. A., Earley, C., Batsford, W. P., & Lampert, R. (2005). Benefits of cardiac rehabilitation in patients with implantable cardioverter-defibrillators: A patient survey. *Archives of Physical Medicine and Rehabilitation*, *86*(10), 1924–1928. https://doi.org/10.1016/j.apmr.2005.04.009

de Melo Ghisi, G. L., Xu, Z., Liu, X., Mola, A., Gallagher, R., Babu, A. S., & Oh, P. (2021). Impacts of the COVID-19 pandemic on cardiac rehabilitation delivery around the world. *Global Heart*, *16*(1), 43. https://doi.org/10.5334/gh.939

Dougherty, C. M., Johnston, S. K., & Thompson, E. A. (2007). Reliability and validity of the self-efficacy expectations and outcome expectations after implantable cardioverter defibrillator implantation scales. *Applied Nursing Research*, *20*(3), 116–124. https://doi.org/10.1016/j.apnr.2007.04.004

Drwal, K. R., Forman, D. E., Wakefield, B. J., & El Accaoui, R. N. (2020). Cardiac rehabilitation during COVID-19 pandemic: Highlighting the value of home-based programs. *Telemedicine and e-Health*, *26*(11), 1322–1324. https://doi.org/10.1089/tmj.2020.0213

Du, Q., Salem, Y., Liu, H. H., Zhou, X., Chen, S., Chen, N., & Sun, K. (2017). A home-based exercise program for children with congenital heart disease following interventional cardiac catheterization: Study protocol for a randomized controlled trial. *Trials*, *18*(1), 1–9. https://doi.org/10.1186/s13063-016-1752-z

Dunn, M. S., Reilly, M. C., Johnston, A. M., Hoopes Jr, R. D., & Abraham, M. R. (2006). Development and dissemination of potentially better practices for the provision of family-centered care in neonatology: The family-centered care map. *Pediatrics*, *118*(Supplement_2), S95–S107. https://doi.org/10.1542/peds.2006-0913F

Duru, F., Büchi, S., Klaghofer, R., Mattmann, H., Sensky, T., Buddeberg, C., & Candinas, R. (2001). How different from pacemaker patients are recipients of implantable cardioverter-defibrillators with respect to psychosocial adaptation, affective disorders, and quality of life? *Heart*, *85*(4), 375–379. https://doi.org/10.1136/heart.85.4.375

Epstein, E., Patel, N., Maysent, K., & Taub, P. R. (2021). Cardiac rehab in the COVID era and beyond: MHealth and other novel opportunities. *Current Cardiology Reports*, *23*(5), 1–8. https://doi.org/10.1007/s11886-021-01482-7

Eslamiankoupaie, S., Parchebafieh, S., Sahebalzamani, M., & Madadi, S. (2018). The effect of education based on Orem's self-care model on emotional reactions in patients with implantable cardioverter defibrillator (ICD). *Iranian Journal of Cardiovascular Nursing*, *7*(3), 6–11.

Golabchi, A., Sokot Arani, S., Mousavi, G., Sadeghi Gandomani, H., & Meydani, Z. (2019). Comparison of the effect of video-training based technique by video and group discussion on the level of stress, anxiety, depression and self-efficacy of patients undergoing pacemaker and cardiac implantation defibrillator. *Journal of Modern Medical Information Sciences*, *5*(1), 12–20. https://doi.org/10.29252/jmis.5.1.12

Hacıhasanoğlu, R., Gözüm, S., & Çapık, C. (2012). Validity of the Turkish version of the medication adherence self-efficacy scale-short form in hypertensive patients. *Anadolu Kardiyoloji Dergisi*, *12*(3), 241–248.

Heran, B. S., Chen, J, M., Ebrahim, S., Moxham, T., Oldridge, N., Rees, K., Thompson, D, R., & Taylor, R, S. (2011). Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database of Systematic Reviews*, *6*(7),CD001800. http://doi.org/10.1002/14651858.CD001800.pub2

Humphreys, N. K., Lowe, R., Rance, J., & Bennett, P. D. (2016). Living with an implantable cardioverter defibrillator: The patients' experience. *Heart & Lung*, *45*(1), 34–40. https://doi.org/10.1016/j.hrtlng.2015.10.001

Jafari Sejzi, F., Morovati, Z., & Heidari, R. (2018). Validation of the cardiovascular management self-efficacy scale. *Medical Journal of Mashhad University of Medical Sciences*, *61*(4), 1112–1121.

Jolliffe, J. A., Rees, K., Taylor, R. S., Thompson, D., Oldridge, N., & Ebrahim, S. (2002). Exercise-based rehabilitation for coronary heart disease (Cochrane Review). *The Cochrane Library*, 1. https://doi.org/10.1002/14651858.CD001800.

Jolly, K., Taylor, R. S., Lip, G. Y., & Stevens, A. (2006). Home-based cardiac rehabilitation compared with centre-based rehabilitation and usual care: A systematic review and meta-analysis. *International Journal of Cardiology*, *111*(3), 343–351. https://doi.org/10.1016/j.ijcard.2005.11.002

Josephson, M., & Wellens, H. J. (2004). Implantable defibrillators and sudden cardiac death. *Circulation*, *109*(22), 2685–2691. https://doi.org/10.1161/01.CIR.0000129322.97266.F3

Keteyian, S. J., Ades, P. A., Beatty, A. L., Gavic-Ott, A., Hines, S., Lui, K., & Sperling, L. S. (2022). A review of the design and implementation of a hybrid cardiac rehabilitation program: An expanding opportunity for optimizing cardiovascular care. *Journal of Cardiopulmonary Rehabilitation and Prevention*, *42*(1), 1–9. https://doi.org/10.1097/HCR.0000000000000634

Ketilsdottir, A., Albertsdottir, H. R., Akadottir, S. H., Gunnarsdottir, T. J., & Jonsdottir, H. (2014). The experience of sudden cardiac arrest: Becoming reawakened to life. *European Journal of Cardiovascular Nursing*, *13*(5), 429–435. https://doi.org/10.1177/1474515113504864

Lewin, B., Robertson, I., Cay, E., Irving, J., & Campbell, M. (1992). Effects of self-help post-myocardial-infarction rehabilitation on psychological adjustment and use of health services. *The Lancet*, *339*(8800), 1036–1040. https://doi.org/10.1016/0140-6736(92)90547-G

Limoee, K., MolaviNejad, S., Asadizaker, M., Heidari, A., & Maraghi, E. (2019). Effect of home-based cardiac rehabilitation on health related quality of life of patients following coronary artery bypass grafting surgery: A randomized clinical trial. *Hayat*, *25*(2), 124–137.

Martin, B.-J., Hauer, T., Arena, R., Austford, L. D., Galbraith, P. D., & Lewin, A. M., … S. G. Aggarwal (2012). Cardiac rehabilitation attendance and outcomes in coronary artery disease patients. *Circulation*, *126*(6), 677–687. https://doi.org/10.1161/CIRCULATIONAHA.111.066738

Mohammadi, F., Taherian, A., Hosseini, M. A., & Rahgozar, M. (2006). Effect of home-based cardiac rehabilitation quality of life in the patients with myocardical infarction. *Archives of Rehabilitation*, *7*(3), 0–0.

Oshvandi, K., Keshmiri, K., Salavati, M., Emkanjoo, Z., & Musavi, S. (2014). Effectiveness of education based on Orem's self-care model in self-care activity of patients with implantable cardioverter defibrillators. *Hayat*, *19*(3), 47–55.

Poortaghi, S., Baghernia, A., Golzari, S. E., Safayian, A., & Atri, S. B. (2013). The effect of home-based cardiac rehabilitation program on self efficacy of patients referred to cardiac rehabilitation center. *BMC Research Notes*, *6*(1), 1–4. https://doi.org/10.1186/1756-0500-6-287

Stefanakis, M., Batalik, L., Antoniou, V., & Pepera, G. (2022). Safety of home-based cardiac rehabilitation: A systematic review. *Heart & Lung*, *55*, 117–126. https://doi.org/10.1016/j.hrtlng.2022.04.016

Stefanakis, M., Batalik, L., Papathanasiou, J., Dipla, L., Antoniou, V., & Pepera, G. (2021). Exercise-based cardiac rehabilitation programs in the era of COVID-19: A critical review. *Reviews in Cardiovascular Medicine*, *22*(4), 1143–1155. https://doi.org/10.31083/j.rcm2204123

Sullivan, M. D., Lacroix, A. Z., Russo, J., & Katon, W. J. (1998). Self-efficacy and self-reported functional status in coronary heart disease: a six-month prospective study. *Psychosomatic Medicine*, *60*(4), 473–478.

Taylor, R. S., Brown, A., Ebrahim, S., Jolliffe, J., Noorani, H., Rees, K., & Oldridge, N. (2004). Exercise-based rehabilitation for patients with coronary heart disease: Systematic review and meta-analysis of randomized controlled trials. *The American Journal of Medicine*, *116*(10), 682–692. https://doi.org/10.1016/j.amjmed.2004.01.009

Thomas, R. J., Beatty, A. L., Beckie, T. M., Brewer, L. C., Brown, T. M., & Forman, D. E., … J. G. Regensteiner (2019). Home-based cardiac rehabilitation: A scientific statement from the American association of cardiovascular and pulmonary rehabilitation, the American Heart Association, and the American College of Cardiology. *Circulation*, *140*(1), e69–e89. https://doi.org/10.1161/CIR.0000000000000663

Turk-Adawi, K., Sarrafzadegan, N., & Grace, S. L. (2014). Global availability of cardiac rehabilitation. *Nature Reviews Cardiology*, *11*(10), 586–596. https://doi.org/10.1038/nrcardio.2014.98

Vahedian-Azimi, A., Miller, A. C., Hajiesmaieli, M., Kangasniemi, M., Alhani, F., Jelvehmoghaddam, H., & Hatamian, S. (2016). Cardiac rehabilitation using the family-centered empowerment model versus home-based cardiac rehabilitation in patients with myocardial infarction: A randomised controlled trial. *Open Heart*, *3*(1), e000349. https://doi.org/10.1136/openhrt-2015-000349

Varaei, S., Cheraghi, M., Seyedfatemi, N., Talebi, M., Bahrani, N., Dehghani, A., & Shamsizadeh, M. (2013). Effect of peer

education on anxiety in patients candidated for coronary artery bypass graft surgery: A randomized control trial. *Journal of Nursing Education (JNE)*, *2*(3), 28–37.

Wang, L.-W., Ou, S.-H., Tsai, C.-S., Chang, Y.-C., & Kao, C.-W. (2016). Multimedia exercise training program improves distance walked, heart rate recovery, and self-efficacy in cardiac surgery patients. *Journal of Cardiovascular Nursing*, *31*(4), 343–349. https://doi.org/10.1097/JCN.0000000000000246

Wang, W., Chair, S. Y., Thompson, D. R., & Twinn, S. F. (2012). Effects of home-based rehabilitation on health-related quality of life and psychological status in Chinese patients recovering from acute myocardial infarction. *Heart & Lung*, *41*(1), 15–25. https://doi.org/10.1016/j.hrtlng.2011.05.005

WHO (2011). *A prioritized research agenda for prevention and control of noncommunicable diseases*. World Health Organization.