

The Role of Continuous Care in Reducing Readmission for Patients with Heart Failure

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ABSTRACT

Introduction: About 20-50% of patients with heart failure are readmitted to hospitals in 14 day to 6 months of hospital discharge. Several supportive programs are developed to reduce post discharge hospital readmissions. The present study was performed to review the clinical trials conducted to determine the effect of post-discharge follow-up on readmission of patients with heart failure (HF).

Methods: Internet search was conducted to identify clinical trial studies that have been conducted on post-discharge follow-up care for patients with HF. Databases of Science direct, Pubmed, Iranmedex, SID and also the Google's search engine were searched for studies that have been published between the years 1995 and 2013. Keywords used in searching Persian databases were included readmission, heart failure, continuous care, and follow-up. Keywords used in searching English databases were included of heart failure, readmission, follow-up and home monitoring.

Results: 21 clinical trials were reviewed. 16 studies have shown that continuous care through patient education before discharge, home visits, and telephone follow up could significantly reduce the rate of post discharge readmissions of patients with HF. However, five studies did not show significant reductions in post-discharge readmissions.

Conclusion: Patient education and continuous post-discharge follow up interventions conducted by nurses could significantly reduce the rates of readmissions to the hospital or to the physicians' office. Considering limited health care resources, using one or a combination of follow-up methods, can reduce the number of readmissions of patients with HF.

Introduction

Patient readmission in a short time after discharging from hospital is an indicator for measuring quality of care.¹⁻³ Researches show that a fifth of patients will be hospitalized again 30 days after discharge.^{4,5} This rate has been reported 40 to 50 percent in America^{6,7} and puts extra costs for the patient and the healthcare system.^{8,9} Preventing hospital readmission and improvement of prognosis are the basis for care and new treatments for heart failure (HF).⁹

Congestive heart failure (CHF) is one of the most common reasons for readmission in the first 60 days after discharging from hospital.¹⁰

Hallerbach et al., have reported that the rate of having HF is 10 cases in 1000 people after the age of 65 years.¹¹ Studies in Iran have shown that the rate of cardiovascular diseases has increased from 5.7% in 1995 to 17.8% in 2006.⁴ Another report from Iran has shown that 29-47% of patients with HF are re-hospitalized in 3 to 6 months after the initial discharge. Cost of readmission for these patients has been estimated to be more than 400 billion Rials in 2003 and this should encourage the authorities and investigators to search for better preventative strategies.¹² Side effects and relapse of the disease and poor knowledge about the disease symp-

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toms, clinical course, diet and drugs are of the most important factors in readmission of these patients.¹³ Therefore, this idea has been brought up that continuity of communication between health-care team and the patient and post discharge continuous care may increase patients' knowledge and enhance their health.¹⁴ Several strategies were chosen by different investigators to reduce the rate of post discharge hospital readmissions of patients with HF. However, there is no consensus on the best method. For instance, Stewart *et al.*, have examined the effect of home visits and reported that with continuous post- discharge home care, the patients' readmission and mortality rates were decreased about 10%.¹⁵ However, some of studies have reported that post-discharge home care did not significantly affect on hospital readmission of patients with HF.^{16,17} Some other investigators have also compared strategies such as telemonitoring, telephone support, or internet follow-up system and reported conflicting results in terms of post-discharge hospital readmissions.¹⁸⁻²¹

Nurses as key members of the health care team, should have an appropriate understanding of continues care programs. This may help them to play a critical role in development of strategies for follow-up and continuous care to prevent readmissions, effective using of resources and decreasing the costs.²² However, in most countries taking care of patients with HF has been limited to hospitals or just some training before discharge from hospital.

Although there are some researches about the effects of post discharge continuous home care,²³ but there is no comprehensive study that summarizes these investigations. The aim of this study was to review the studies that have used continuous post-discharge follow-up care to see what effect the different strategies had on reducing the rates of post-discharge hospital readmissions of patients with HF.

Materials and methods

Internet search was conducted to identify clinical trial studies that have been researching the post-discharge follow-up care for patients with HF. Databases of Science direct, Pubmed, Iranmedex, SID and also the Google's search engine were searched for studies that have been published between the years 1995 and 2013. Keywords used in searching Persian databases were included readmission, heart failure, continuous care, and follow-up. Keywords used in searching English databases were included of heart failure, readmission, follow-up and home monitoring. All the clinical trial and interventional studies conducted on human subjects with HF and have studied the post-discharge follow-up care and readmission to the hospital, published in the English and Persian languages, and whose full-texts were retrievable, were included in the review. Reviews and systematic reviews, articles published in languages other than English or Persian; studies whose full-text was not retrievable, and studies without follow-up and continues care, and non-interventional studies such as surveys and descriptive studies were excluded from this review. Searching for the studies was performed by the second author and then was checked by the first author of this manuscript. Type of the study, aims, number of groups in the study and number of the patients in each group, type of intervention, type of the follow-up care and main outcomes of the study, were extracted and recorded in forms that were designed beforehand. This review was conducted only on reports published in English and Persian languages and their full text were accessible on the Internet search. Therefore, there maybe studies in other languages and/or their full text were not accessible for the researcher of this review. It is also possible that there are studies that were not published in an electronic format or

published in databases other than those we used in this review. Therefore further studies may be suggested to include the reports published in other languages or by means of other types of publication.

Results

At the end of search, there were 37 articles about the effects of continuous care in patients with HF; of them 7 studies were Iranian studies and the others were conducted overseas. From 7 Iranian studies, three ones were descriptive or did not report the post discharge readmissions and then were discarded. From 27 non-Iranian studies, four studies were only available by abstracts, 3 articles were about predictors of hospital readmission in patients with HF, 2 articles have compared the outcomes of patients with HF and reduced ejection fraction, and one study reported the effect of drug therapy at home. At the end, there were 21 articles with clinical trials methods that have been studied the effect of post-discharge follow-up care on reducing readmission for patients with HF (Table1).

Most of the these studies have found that nursing care after discharge from hospital and continuous follow-up care is effective in controlling HF and reduces readmission and patients' medical expenses.

The methods of the reviewed studies are different in terms of the type of training and follow-up duration but their methods can be categorized into 4 categories; training before discharge, home visits; and follow-up with phone or Internet.

Training before discharge from hospital

From 10 clinical trials, 7 studies were about training on food diet, medications, activity, sleep and the manners for changing behavior and life style. Kasper et al., have studied the effects of a 6-month continuous post discharge care on patients with HF. In this study, a multidisciplinary training program about follow up care was designed with collaboration of a team consisted of

cardiologists, general practitioners and nurses and implemented before hospital discharge.¹⁶ Naylor et al., studied the effect of a one month comprehensive program including of pre discharge training and home care follow-up on 363 patients with HF. After assessing the patients' individual needs, a training and discharge plan on food and drug regiments, activity and sleep and follow up care was designed and conducted by a nurse before hospital discharge.²⁴ In two trials, Salehi Tali et al., in Iran¹³ and Vavouranakis et al., in Greece, trained patients with HF about food diet, physical activity, self monitoring of weight, heart rate, blood pressure, clinical status, and drug regiments. Then, they longitudinally followed the patients to evaluate the effects of such programs on the rate of readmissions, referrals, and health care costs.²⁰ In a 2-year clinical trial on 460 patients with HF, Giordano et al., randomized the patients in two groups of control and intervention. Before discharge, all patients were educated about, self monitoring of daily weights, blood pressure, and dietary restrictions, including sodium and fluid, and signs and symptoms of a HF exacerbation. The intervention group also had a portable device with them that could record patient's ECG and send it to the nurse via telephone. In case of any problem, nurses could remind patients what they should do.²⁵ Also, Rich et al., conducted a randomized trial on 282 patients with HF and their families to evaluate the effect of a nurse-directed training program about a prescribed diet, social-service consultation and medications, on rates of readmission within 90 days of hospital discharge.²⁶ Another clinical trial also evaluated the effect of a pre-discharge training about home based self-care and disease management and reported that the rate of readmissions was significantly lower in the intervention group in comparison with controls at 90 days of hospital discharge.²⁷ Another study examined the effect of a training program about proper exercise for HF patients. Then

patients were followed for 12 months and reported that the training program significantly improved the patients' quality of life (QOL).²⁸ In a clinical trial a combination of training methods were used to train HF patients before discharging from hospital. The patients were trained by nurses about HF and its treatment, drugs, diet, exercise, self monitoring of weight and ECG and self-management including early detection and management of decompensation and methods of contacting with other health care workers as required. Patients were followed for 1 year. The study showed a significant reduction in readmissions and improvement in QOL for the intervention group.²⁹ Hekmatpou *et al.*, also conducted a quazi-empirical study in Tehran, Iran, in which patients with HF and their family members were educated about the process of disease; disease management; self care, common reasons for readmissions, its costs and how to reduce the risk of readmissions. Then they followed the patients for 3 months. The rate of readmission significantly reduced in the intervention group so that more than 71% of patients in this group did not need readmission.¹² Despite this, in another Iranian study, Shojaee *et al.*, allocated 189 patients with HF in 3 groups. One group received self-care education before discharge, the second group received telephone follow-up advices and the controls treated as usual. The study showed that there was no significant difference between the trained group and controls in terms of readmissions to the hospital or to the physicians' office within 3 months of discharge.³⁰

Home Visits

Post discharge home visits play an important role in reducing readmission rates in patients with HF. Eleven of the reviewed studies used post discharge home visits solely or in combination with other interventions. Naylore *et al.*, have conducted a comprehensive discharge planning including

two or more home visits at 48 hours and 7-10 days after hospital discharge besides several telephone follow-ups to assess the patients' and care givers caring needs, answer their questions, monitor the patient health and identify any readmissions.²⁴ Salehi Tali *et al.*, in Iran at 1,2 and 3 months after discharge,¹³ and Dracup *et al.*, at 3, 6 and 12 months²⁸ and Holland *et al.*, at 2 and 8 weeks after discharge performed home visits and gave the patients advices about medications, exercise, and dietary restrictions.¹⁷ In a study by Kasper *et al.*, weekly home visits were conducted by a multidisciplinary team including nurses and doctors.¹⁶ Within 12 months of hospital discharge, Vavouranakis *et al.*, performed monthly home visits for monitoring the patients' weight, blood pressure, heart rate and ECG. They also obtained blood samples for laboratory tests each two months.²⁰ Hekmatpou *et al.*, also conducted a quazi-experimental study on patients in Tehran cardiovascular centers. This study had 4 phases including cognitive restructuring of patients and the caring team, comprehensive discharge planning, planned self care, and creating and sustaining hope in patients. The last 2 phases were conducted as home visits for 3 month. The intervention significantly decreased readmissions in the trial group.¹² Stewart *et al.*, studied the effect of a post discharge home based intervention on 279 patients. The intervention group was visited by a physician and a nurse within 7 to 14 days after discharge. During this visit the patient's problems since discharge were assessed and necessary advices were given. At the end of this study the rate of readmission in the intervention group has reduced to 27% while this rate was 37% in the control group.¹⁵ Blue *et al.*, started home visits of patients with HF shortly after discharge and continued the project for up to 1 year. Home visits were performed by nurses. They focused on early detection and treatment of decompensation, assessed the patients' problems and presented them required advices.²⁹ In a clinical trial in Iran,

Hajikazemi et al., evaluated the effect of home visit on readmission rate of patients with HF within 6 months after discharge. Three home visits were carried out in the intervention group at one week and 2 and 4 months. Home visits focused on assessing patients problems giving required advices.³¹ Naylor et al., conducted a clinical trial with one year follow-up after hospital discharge. At least eight home visits were performed by nurses at the first 3 months including one within 24 hours of discharge, and then weekly visits during the first month and bimonthly visits during the second and third months. Telephone follow-ups were used for the rest of the study. Advices and training regarding optimal therapeutic management such as medications, exercise, food diet, work and activity were given through home visits. At the end of the study, intervention group had fewer readmissions and lower mean total costs.¹⁹ In contrast, another clinical trial has reported that post discharge home visits and patient training in medication, diet, exercise and smoking cessation did not affect the rate of readmissions of patients with HF within six months of discharge.¹⁷

Telephone follow-up

In several clinical trials, telephone interviews were used as a post discharge follow-up method solely or in combination with other interventions. Blue et al., used a number of planned home visits of decreasing frequency for follow up at the early post discharge days that then substituted with the patients' telephone contact with members of the study team as needed.²⁹ Naylor et al., have also supplemented their home visits with nurses' telephone availability 7 days per week and then substituted them with patient telephone interviews at 2, 6, 12, 26, and 52 weeks after hospital discharge to obtain information about re-hospitalizations.¹⁹ In a study by Weintraub et al., over the 90- days of the study, nurse managers phoned weekly to all patients in intervention and control groups to review clinical status, re-hospitalizations,

mortality, compliance, and QOL. Patients could also phone the nurse managers if there was any problem.²⁷ Rich et al., in a 90 days period studied the effects of multidisciplinary interventions to prevent the readmission of 282 elderly patients with HF. They conducted post discharge home visits and patients could phone to members of the study team if needed.²⁶ Cleland et al., assigned patients into 3 groups of usual care, group that received nurse telephone support, and the group with home telemonitoring (who had a digital device for telemonitoring of weight, blood pressure, heart rate and ECG). No significant differences were observed in readmissions of the 3 groups.¹⁸ Also Shojaee et al., in Iran, have used of telephone follow-up and did not find a difference in hospital readmission in comparison with groups received usual care or self care training.³⁰

In four clinical trials only telephone contacts were used to follow-up the patients with HF. Heidenreich et al., studied 68 patients with HF in a 12 month period. Each patient received weekly educational mailings and a 10-minute call from a nurse to discuss and reinforce the educational points. Any changes and problem was also recorded. Compared with the prior year, readmissions and medical costs per year decreased in the intervention group, whereas they increased in the control group.³² Riegel et al., performed a controlled trial on 358 patients with HF to assess the effect of telephonic case management on readmissions. Over a 6-month follow-up period, intervention group received an average of 17 phone calls by a nurse and received educations on diets and medication regimens and life style modification. The rate of readmission significantly decreased in the intervention group.³³ Mortara et al., conducted a clinical trial to assess the effect of a new system of home telemonitoring on patients with HF. Patients were assigned in 4 groups including a control group, and a group that received monthly telephone contacts from a nurse to check on

their clinical status and vital signs. Besides of telephone contact, the other two groups received non-invasive cardio respiratory monitoring. Over a 12-month follow-up, there was no significant difference in hospitalization of the three intervention groups; however patients who received telephone contact with additional monitoring had less readmission.³⁴ Shah *et al.*, followed-up 27 patients with HF via phone. Patients were given a sphygmomanometer, a weight scale and also had 24-hour telephone access to a nurse to report their medical condition. A nurse also phoned them weekly to assess their clinical status such as changes in weight and blood pressure. In 8 months the number of hospitalizations was reduced in comparison with the equivalent period before entering the study.³⁵

Internet follow-up

Among reviewed studies only one study followed up the patients through a post discharge Internet-based telemedicine system. In this study, Kashem *et al.*, randomized 48 patients with HF, 24 in usual care group and 24 ones in Internet-based system. Each patient in the intervention group had a username and password on a database and could communicate with a nurse and send data related to their blood pressure, body weight, heart rate, and other symptoms and receive educational materials through the Web site. The patients in control group could communicate with the nurse via telephone if needed. This internet based follow up system was more effective than other studies. In one year, only 8.0% of the intervention group had readmissions while this rate was 41.6% for the usual care group.²¹

Discussion

We reviewed 4 Iranian studies and 17 studies conducted oversea and these studies showed that patient education, in conjunction with post-discharge follow-up and continuous care through home visits, and telephone follow-up would decrease the rates of

readmissions to the hospital or to the physicians' office and medical costs in patients with HF.

Education before discharge from hospital

Patient education while they are hospitalized and during the discharging phase is the cornerstone of HF management. Education give patients the required information on what they should follow, would increase the patients' adherence with the health-care team advices, would reduce their concerns, prevent the possible complications, and help them recover more effectively. From ten clinical trials that have studied education before hospital discharge, 6 studies including 3 Iranian studies, educated patients on medications, food diet, exercise, activity and rest, manners of changing behavior and life style modification. All of these studies have significantly reduced the rates of hospital readmissions in patients of the trial groups in comparison with the controls.^{13,16,26} One clinical trial trained patients in self-care and checking on the symptoms. Although the overall frequency of hospitalizations did not significantly differ between the intervention and control groups, but HF hospitalizations and HF inpatient days were lower in the intervention group.²⁷ Another clinical trial has only studied the effect of exercise and walking on clinical outcomes in HF. This intervention has also reduced the rate of readmissions in patients with HF.²⁸ In another study, Blue *et al.*, have used of a combination of training methods before discharge and reported a significant reduction in hospital readmissions in the intervention group.²⁹ These studies signify the importance of education before hospital discharge. Considering existing hospital based health-care system in the most of countries, patient education before hospital discharge could be a simple and low cost method for reducing readmissions of patients with HF. This method could also be effective

Table 1. The list of studies entered the review

Author	Objectives	Type of study	Number of patients	Interventions	Results
Rich (1995)	To assess the effect of a multidisciplinary intervention on the rate of readmission, QOL, and the overall cost of medical care	A prospective, randomized trial	282 patients included (140 intervention, 142 control)	Education of patients and their families before discharge, individualized dietary and medication recommendations, consultation with social-service workers; follow-up home visits and telephone contacts	Reduce readmissions in 90 days. There was 67.1% of readmissions in the control group and 37.3% in the intervention group (P=0.02).
Heidenreich (1998)	To examine the effects of a home based monitoring program on hospitalizations and cost of care for patients with HF	A follow-up trial	68 patients were allocated in two groups of intervention and controls.	Patients received weekly educational mailings and a 10-minute call from a nurse. Each day the patients called a toll-free number and entered their clinical data.	The mean of readmissions per one year was 1.9 day in the intervention group while it was 3.4 days in the controls. Also, medical costs were significantly lower in the intervention group (P=0.04)
Shah (1998)	To determine the effect of patient education and home based telephone monitoring on hospitalizations.	A non-randomized, prospective pilot study	27 patients	Mail based patient educations, Weekly telephone communications	The number of hospitalizations were reduced from 0.6 to 0.2 patient year (p<0.05) during 8 months
Naylor (1999)	To examine the effectiveness of a nurse centered discharge planning and home follow-up on hospital readmissions	A randomized clinical Trial	363 patients included (177 intervention, 186 control).	Comprehensive discharge planning, Home follow-up, Telephone availability of a nurse, Telephone follow-up at 2, 6, 12 and 24 weeks after discharge	Reduced readmission in for 24 weeks (37% in control group and 20.3% in intervention group, P<0.001)
Blue (2001)	To determine the effect of specialist nurse intervention of re admission, morbidity and mortality in HF	A randomized controlled trial	165 patients included (84 intervention, 81 control).	Patient education, Home visits, Supplementary telephone contacts	Reduced readmissions in 1 year (37% in intervention group and 53% in controls, P=0.018).
Hajikazemi (2001)	To determine the effect of home visit on readmission rate	A field trial with control group	Control group=50 Intervention group= 50	Four home visits and two telephone contacts	Reduced readmissions at 6 months (26.7% in intervention group and 39.5% in controls P=0.04)
Riegel (2002)	To assess the effect of a telephonic case-management intervention in decreasing resource use and readmissions	A randomized controlled trial	358 patients were included (130 intervention, 228 control)	Contact via phone and patient education	Reduction in readmissions and resource use in intervention group than control group during 6 months. P = 0.03

Table 1. (continued) The list of studies entered the review

Author	Objectives	Type of study	Number of patients	Interventions	Results
Stewart (2002)	To assess the effects of a home-based intervention readmission and survival	A randomized clinical trial	297 patients with HF	Home visits on days 7 to 14	Reduction in readmissions in intervention group than controls at 4 years (27% vs. 37%) P<0.05
Kasper (2002)	To determine whether an outpatient management program decreases readmissions and mortality	A randomized controlled trial	200 patients were included (102 intervention, 98 control)	Monthly home visits and telephone contacts (weekly at first and then monthly)	Readmission and mortality rates were lower in intervention group than controls over a six-months(P=0.09).
Vavouranakis (2003)	To investigate the effect of home-based intervention on readmission and QOL	A follow –up study	33 patients	Patient education, home visits, monthly telephone contacts	Readmissions decreased from 2.143 for the year before to 1.25 after the study completion (P=0.0005). QOL improved.
Naylor (2004)	To examine the effect of a discharge planning and home follow-up intervention directed by nurses on readmission of HF patients	A randomized, controlled trial	239 patients were included (118 intervention, 121 control)	Home visits, (at first weekly and then bimonthly), telephone contacts with regularly increasing intervals	Readmissions decreased by 10.5% in the intervention group over one year (P=0.121).
Cleland (2005)	To compare the effect of home telemonitoring (HTM) and nurse telephone support (NTS) on readmissions of patients with HF.	Multicenter randomized trial	426 patients were randomly assigned in control (n= 85), and intervention groups (n1=173, n2= 168)	Control group received usual care, Group 1 received NTS, Group 2 received HTM	readmissions were somewhat decreased in intervention groups in 240 days. Control group= 54% Group1= 49% Group2= 47%
Holland (2007)	To test the effect of a drug review and lifestyle advice home visits intervention by pharmacists on hospital readmissions.	Randomized controlled trial	293 patients were included (149 intervention, 144 control)	Two home visits by pharmacists within two and eight weeks of discharge	At 6 months, 134 readmissions occurred in the intervention group compared with 112 in the control group (P=0.28)
Kashem (2008)	To test the effect of an Internet-based telemedicine system on re-hospitalization of HF patients.	A randomized controlled trial	48 patients were included (24 intervention, 24 control)	Intervention group were followed up through an Internet-based system while the controls contacted via phone.	Significant reduction in readmissions were occurred in intervention group (8.3%) than the control group (41.6%) p<0.05.

Table 1. (continued) The list of studies entered the review

Author	Objectives	Type of study	Number of patients	Interventions	Results
Dracup (2007)	To determine the effects of a home-based exercise program on clinical outcomes and readmissions	A randomized controlled trial	173 patients were included (87 intervention, 86 control).	Education, exercise at home and regular nurse home visits	In 1 year, patients in the exercise group had fewer (12.8%) hospitalizations compared with the control group (26.6%). P = .01
Giordano (2009)	To determine the effects of home-based telemanagement on hospital readmission	A multicenter randomized trial	460 HF patients were enrolled (230 intervention, 230 control)	Education before discharge, Patients transmitted their vital information via a fixed or mobile phone and received appropriate advices.	During 1 year, the intervention group had fewer (24%) readmissions compared with the control group (36%). P=0.01
Salehi Tali (2009)	To assess the effect of continuous care and education on the rate of readmissions	A randomized clinical trial	99 patients enrolled (50 control, 49 intervention)	Education at discharge, Home visits, Telephone contact months 1 to 3 months.	During 6 months, the mean of hospital readmissions was 1.65 vs. 2.74 (in intervention and controls, respectively) P=0.01
Hekmatpou (2009)	To assess the effectiveness of applying a caring model for "making sensitivity to re-admission"	Quasi-experimental	120 patients were included (62 intervention, 58 control)	Self-care education, Discharge planning, Telephone contact and SMS, and sensitization towards readmission	In 90 days, Significant reduction was observed in readmission rate in the intervention group (0.33 vs. 2.62). P=0.001
Mortara (2009)	To assess the effect of a system of home telemonitoring on hospitalization and bed occupying.	A randomized controlled trial	461 patients were assigned in 1 control group and 3 different intervention groups.	Control group received usual care. Group 2 contacted via phone. Group3 received telephone contact+ control of vital signs. Group 4 treated like group3+ noninvasive monitoring	Over 12-months, there was no significant difference between the 4 groups in terms of bed occupancy and re-hospitalization.
Weintraub (2010)	To assess the effect of an automated home monitoring (AHM) and telephonic disease monitoring on readmission	A multicenter randomized controlled trial	188 patients were assigned in two groups in 1:1 ratio	A special program (including an outpatient visit, self-care educations; telephone contacts) was conducted in both groups. The intervention group also received an AHM system to transmit vital signs via a standard telephone line.	In 90 days, significant reduction was observed in readmissions of the intervention group (12.76% vs. 31.91%, P= 0.05).
Shojaee (2013)	To assess the effect of patient education and telephone follow up by nurse on readmissions of HF patients.	Quazi-experimental	189 patients were assigned into three groups of 63 participants.	Control group= usual care. Group 1= one hour face to face education+ an educational booklet at time of discharge. Group 2= treated like group1+telephone follow up	Discharge education and telephone follow up decreased readmissions significantly in 90 days. (P=0.03)

because patients have more powerful motivation to learn when they are in hospital and newly recovered from an acute problem. Three of 4 Iranian studies and most of studies conducted in other countries that used education before discharge reinforced their intervention with complementary telephone contacts. This may signify the importance of continual interactions between patients and health care team and especially with nurses. However, to execute this method there should be more nurses in charge of patient education and if possible a comprehensive discharge planning system should be designed to train patients and empower them to be self-care at discharge. This could be an effective way for reducing patients' costs and hospital readmissions.

Home Visits

Considering the time and costs required for referring to the cardiac clinics, home visits by the health care team members is one the best strategies for health promotion and disease prevention. As Iran's health care and nursing systems are strictly hospital based, only one of 4 Iranian studies has used home visits. However, in 11 clinical trials, post-discharge home visits were conducted in combination with other follow up methods and in most of them the rates of hospital readmissions were reduced.

During home visits, nurses could gather the best information about the patients' life style, abilities and disabilities. Such information can help them to make the best caring plans and give the clients appropriate advices.^{12,13,17,19,27} Studies have shown that home visits are the best strategy to assess the patients and their families, give them proper information, reinforcing prior trainings,^{19,24} monitoring the patients' clinical condition, changes in weight, blood pressure, and symptoms, advice on medications, and planning for further follow-up if needed.^{18, 20} Home visits could signify the importance of and multiple roles a public health nurse could play in the health of patients with HF and their families. During home visits, nurses train patients and their

families of potential health risk factors, the process of disease management and consequently may reduce the number of patient's hospital readmissions. Moreover, home visits may not only decrease the readmission rates but also would decrease the patients and families medical expenditure, make them more sensitive to collaborate in the disease management and to engage in the process of continuous care.

Home visits aimed to assess the patients' functional capabilities, changes in the clients' condition and understand how they follow the medical orders and nursing recommendations, and reinforcement of trainings. Nurses could also find out the patients problems, and inform the physician to find the way to overcome the client's problem.

Telephone follow-up

Telephone follow-up is being used in a lot of prevention and medical centers in the world. This type of follow up is cost saving and helps to reduce unnecessary readmissions to the hospitals or to the physicians' office and consequently increases the efficiency of the medical and caring centers.

In 15 clinical trials, nurses used of telephone follow-up for patient training on medications, food diet, life style modification^{15,31,34} answering patients' questions^{19,25} reinforcing and reminding some information^{13,18,19,21} monitoring and evaluation^{19,24} evaluating the patients functional status and provision of psychological support.²⁰ Although using telephone follow up for evaluating changes in the clients' condition, answering their questions and giving advices or modify the recommendations have resulted in reduced patients medical expenditure, however, the studies that did not combined the telephone follow up with other strategies, did not significantly affect the hospital readmission rates in patients with HF.^{32,34,35} Otherwise, telephone follow up could usually successfully reduce the number of hospital readmission when complemented with other strategies such as home visits.

Internet follow-up

Experts believe that internet based learning could increase and enhance learning opportunities, accelerate access to updated data, and facilitate access to the learning resources and lifelong learning. An Internet-telemedicine approach also provides a newer means to provide patients' access to their health care providers. Such systems can provide a framework for chronic medical management that facilitates nurse-patient and patient-physician communication and education.²¹ Using such internet based system may help patients to send their clinical, functional and disease related symptoms or problems to their caring team and give appropriate advises. In this review only one study used such a strategy and was more effective than other studies.²¹ Despite many benefits in using Internet, however, this strategy may not be applicable for a wide range of the community because of limitations such as lack of literacy especially among the old age patients, lack of access to a computer and an internet access in all the community, and low computer and internet literacy among the majority of patients.

Conclusion

Studies showed that patient education and continuous post-discharge follow-up interventions conducted by nurses could significantly reduce the rates of readmissions to the hospital or to the physicians' office. As regards to growing incidence of HF, special measures should be taken to reduce readmission of patients in hospitals. Post discharge follow-up strategies such as training before discharge from hospital, home visits, follow-up via telephone and Internet could reduce both readmissions to the hospital or to the physicians' office. Considering limited health care resources, using one or a combination of these methods for follow-up can not only reduce the number of readmissions for patients with HF but also may enhance the patients' recovery, improves their quality of life and decrease

the medical expenditures both for patients and the health care system. Because most of the follow-up studies for patients with HF were conducted in western countries, examining the effects of such post-discharge follow-up studies in Iran may help our patients and the authorities and policy makers in the health care system to select the best follow-up strategies for a chronic condition such as HF. Also given the widespread use of cell phones, examining of the effect of follow-up communications via short message system (SMS) is suggested.

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Ethical issues

None to be declared.

Conflict of interest

The authors declare no conflict of interest in this study.

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