

Effect of Implementing Nursing Educational Program on Re-admission rate for Patients with Heart Failure

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Abstract:

Back ground: About 20-50% of patients with heart failure are readmitted to hospitals in 14 day to 6 months of hospital discharge worldwide. **Aim of the study:** This study was performed to evaluate the effect of implementing nursing educational program on re-admission rate for patients with heart failure. **Research design:** Quasi experimental research design was utilized to conduct this study. (study and control group). **Setting:** This study was carried out in the cardiovascular medicine department at Assiut University Heart Hospital. **Sample:** The study sample consisted of (50) heart failure patients for each group; ages ranged from 18-65 years old. **Tool:** Patient assessment sheet and re-admission assessment sheet. **Results:** The highest percentages of causes for readmission in this study were drug non-compliance (25.8%), bad dietary habits (22.6%), uncontrolled diabetes mellitus (22.6%), ischemia (19.4%), anemia (16.1%) and worsening left ventricular function (16.1%), there was a significant difference between study and control groups regarding their mean frequency of readmission with a p-value of (0.041) and period from discharge to 1st re-admission with a p-value of (0.044). **Conclusion:** After 6 months of follow-up, there was a significant difference between groups regarding their mean frequency of re-admission with a p-value of (0.041) and period from discharge to 1st re-admission with a p-value of (0.044).

Key words: Educational program, Heart Failure, Nursing & Readmission.

Introduction

Heart failure (HF) is a serious chronic cardiac condition that commonly occurs due to a structural or functional impairment of the heart muscle so that the heart's capacity to transport enough blood is weakened. This can result in signs as fluid retention and such symptoms as dyspnea, fatigue, and requires lifelong and constant patient involvement to carry out adequate, continuous self-care. Unfortunately, many patients with HF fail to achieve adequate self-care behavior, such as following medical prescriptions, which leads to readmissions (**Kristiansen et al., 2017**).

Heart failure is a global pandemic affecting more than 26 million people worldwide and in developed countries approximately 1–2% of the adult population. Its prevalence increases with age and comorbidities such as hypertension, obesity, and type 2 diabetes mellitus (T2DM) (**Ofstad et al., 2018**).

Along with the high disease prevalence, there is also a significant cost burden related to HF. The annual worldwide cost of HF has been estimated to be US\$108 billion, which is about 1–2% of the global healthcare budget (**Voigt et al., 2014**). A major factor contributing to this heavy economic burden is the high rate of readmissions associated with HF. As a result, reducing hospital readmissions in HF patients has been a top priority of health policy agencies to improve quality of care and lower health care costs (**Pandey et al., 2016**).

In Egypt, Saudi Arabia and United Arab Emirates about 1.35 million patients are being treated for HF. The total estimated costs are US \$ 1.92 Billion. Annual per-patient costs were highest in UAE followed by SA and EG. Inpatient admission cost was the major cost driver ranging from 25% to 56% (**AlHabeeb et al., 2018**).

Heart failure most often develops as a result of hypertension, coronary artery disease, myocardial infarction, DM, or cardiomyopathy. The chronic nature of HF, coupled with multiple complex cardiac and noncardiac comorbidities, predisposes persons with HF to frequent hospitalizations (**Giamouzis et al., 2011**), (**Page & Lindenfeld, 2012**).

Education is a vital component of care to improve the outcomes of patients with HF. Patients who are not knowledgeable about their disease and their medications are at a severe disadvantage, as reflected by higher rates of hospitalization and mortality. Effective education of patients and their caregivers requires a multidisciplinary team approach and should emphasize adherence to treatment, lifestyle recommendations, and help the patient to recognize the symptoms and signs that indicate progression of the disease (**Cleland et al., 2011**).

Nurses are critical to the success of patient education, as they play a pivotal role in discharge education. They are often the ones providing patients with the discharge instructions as all patients with HF need to know how to monitor and report their symptoms and weight fluctuations, restrict sodium intake, adhere to their prescribed medication regimens, and stay physically active. Educating patients before discharge has been shown to reduce readmissions, and poor adherence to discharge instructions can lead to worsening HF and readmissions (**Rasmusson et al., 2015**).

Aim of the study:

The aim of this study was to evaluate the effect of implementing a designing nursing educational program on re-admission rate for patients with heart failure.

Patients and Methods:

Research design:

Quasi experimental research design was utilized to conduct this study. (study and control group).

Hypothesis:

Re-admission rate for studied group patients with heart failure will be reduced after implementing of a designing nursing educational program than control group.

Setting:

This study was conducted in the cardiovascular medicine department at Assuit University Heart Hospital / Assiut University Hospital.

sample:

The study sample consists of a (100) heart failure patients; (50) for each group; ages ranged from 18-65 years old from both sexes, admitted to the cardiovascular medicine department and agreed to participate in the study.

Sample size calculations:

A power calculation estimated that in order to detect an effect size of about 9% difference in readmission rate for patients between two independent groups (**Liou et al., 2015**), with a p-value < 0.05 and 80% power, confidence level 0.95, a sample size of 50 patients for each group was needed. This calculated using G Power 3.1 (**Hsieh et al., 1998**).

Study tools:

In order to collect the necessary information for this study, the following tools were used:

Tool I: Patient assessment sheet:

It was developed by the researchers based on national and international literature review (Xexemeku et al., 2014), (Deek et al., 2016) and it divided into two parts: -

Part 1: Demographic data of the patient: This part aimed to assess data such as (age, sex, marital status, educational level, occupation).

Part 2: Medical data assessment: This part was developed to assess Patients medical history and risk factors

Tool II: Re-admission assessment sheet: It was developed by the researcher based on national and international literature review (Deek et al., 2016), (Wang et al., 2017) to assess readmission regarding:

- 1- Frequency of readmissions (once, twice, three times, four times, five times...etc.)
- 2- Period from discharge to readmission in days (mean \pm SD).
 - a- Period from discharge to 1st readmission in days (mean \pm SD).
 - b- Period from discharge to 2nd readmission in days (mean \pm SD).
 - c- Period from discharge to 3rd readmission in days (mean \pm SD).
- 3- Causes of re-admission: those who at risk (uncontrolled DM, Uncontrolled blood pressure, CAD and dyslipidaemia), chest infection or any other infection, anaemia, non-compliance with medication, poor compliance with diet regimen, Worsening left ventricular function, Hypoxemia, Ischemia.

Nursing educational program:

This program was developed by the researchers based on national and international literature review (Paul; 2008), (Shively et al., 2013), (Liou et al., 2015) and (Moertl et al., 2017), researchers experience and opinions of the medical & nursing expertise. It was divided into 7 parts:

1- Information about; the heart and its function, meaning of heart failure.

2- Activity and exercises.

3- Nutrition.

4- Medication used.

5- Weight control.

6- Instructions to HF patients to prevent predisposing factors such as chest infection, undue exercise and smoking.

7- Discharge Instructions.

This program was divided into three educational sessions which conducted for each patient in the study group.

- The first session; included information about the heart and its function, meaning of HF, information about daily activity and exercises, information about specific nutrition for HF patients. The second session; included information about signs and symptoms, and medication used, Instructions about the importance of daily weight monitoring and control, instructions to prevent predisposing factors such as (chest infection, undue exercise and smoking). The third session; included discharge instructions for HF patients. The duration of each session about 15 minutes and according to patient tolerance. At the end of each session discussion and feedback was made.

Methods of data collection:

- 1- Content validity for the designed tools was judged by jury of expertise (three supervisors of medicine and medical surgical nursing at Assiut university) who reviewed the tools of data collection for clarity, relevance, comprehensiveness, understanding, applicability and easiness.

- 2- A pilot study was carried out to test the feasibility and practicability of the study tools on 10% of sample (10) patients.
- 3- An educational program was developed based on the findings of the jury & the pilot study.
- 4- Informed written consent was obtained from patients or guidance who were willing to participate in the study, after explaining the nature and purpose of the study. Participant patients were interviewed by the researcher to fill in the tools sheet.
- 5- The interview method was used to collect the necessary data for this study.
- 6- Every patient was interviewed for three times.
- 7- The first-interview was used to collect the base line assessment data using the first tool (**Patient assessment sheet**) and implement the nursing education program to the studied group except discharge instructions.
- 8- Second interview was conducted immediately before discharge and it was used to implement discharge instructions to the studied group.
- 9- The third interview was the last one and it was carried out for readmitted heart failure patients for 6 months following patient discharge by follow up through telephone calls then meetings for interview the patient using the second tool (**Re-admission assessment sheet**), and it was used for evaluation of the effectiveness of the implemented education program for the study group by comparing the frequency of hospital re-admission for the study and control group.

Ethical considerations:

- Permission to carry out the study was obtained from Ethical Committee in the Faculty of Nursing.

- Informed written consent was obtained from patients or guidance who were willing to participate in the study, after explaining the nature and purpose of the study.
- There is no risk for study subject during application of the research.
- The study followed common ethical principles in clinical research.
- Confidentiality and anonymity were assured.
- Patients have the right to refuse to participate and or withdraw from the study without any rational any time.

Statistical analysis:

Data were verified, coded by the researcher, and analyzed using IBM-SPSS 21.0 (IBM-SPSS Inc., Chicago, IL, USA) *. Descriptive statistics: Means, standard deviations and percentages were calculated. Test of significances: Chi-square/Fisher’s Exact test was calculated to compare the frequencies among groups. Independent t-test analysis was carried out to compare the means of dichotomous data. Significant variables from the univariate analysis were entered in multivariable logistic regression model to test the independent predictors of re-admission in patients with HF using odds ratio (OR), 95% confidence interval (CI), p-value. A significant p-value was considered when it is less than 0.05 (IBM_SPSS, Ver.21, 2012).

Results:

Table 1. Baseline demographic characteristics of study vs. control groups (n=100).

Items		Study group (n = 50)	Control group (n = 50)	P-value
Age in years	Mean ± SD	55.64 ± 10.4	55.80 ± 10.7	= 0.940*

Sex	Male	37 (74%)	38 (76%)	= 0.817**
	Female	13 (26%)	12 (24%)	
Marital Status	Unmarried	8 (16%)	4 (8%)	= 0.218**
	Married	42 (84%)	46 (92%)	
Educational level	Non-Educated	25 (50%)	21 (42%)	= 0.422**
	Educated	25 (50%)	29 (58%)	
Occupation	Unemployed	43 (86%)	38 (76%)	= 0.202**
	Employed	7 (14%)	12 (24%)	

*T-test analysis was used to compare the mean difference between the two groups

**Chi-square Test analysis was used to compare the difference in proportions

Table 2. Risk factors for heart failure of Study vs. Control groups (n=100).

Items		Study group (n = 50)	Control group (n = 50)	P-value
Diabetes mellitus	Yes	22 (44%)	19 (38%)	= 0.342*
	NO	28 (56%)	31 (62%)	
Dyslipidaemia	Yes	2 (4%)	1 (2%)	= 0.558**
	NO	48 (96%)	49 (98%)	
Renal Trouble	Yes	0 (0%)	1 (2%)	= 0.315**
	NO	50 (100%)	49 (98%)	
Thyroid Function Problem	Yes	3 (6%)	1 (2%)	= 0.309**
	NO	47 (94%)	49 (98%)	
Hypertension	Yes	21 (42%)	14 (28%)	= 0.104**
	NO	29 (58%)	36 (72%)	

Ischemic heart disease	Yes	18 (36%)	23 (46%)	= 0.208**
	NO	32 (64%)	27 (54%)	
Smoking	Yes	28 (56%)	32 (64%)	= 0.270**
	NO	22 (44%)	18 (36%)	

*Chi-square Test analysis was used to compare the difference in proportions

**Fisher's Exact Test analysis was used to compare the difference in proportions

Table 3. Re-admission data of study vs. control groups (n=100).

		Study group (n = 50)	Control group (n = 50)	P-value
Re-admission	No	37 (74%)	32 (64%)	= 0.194*
	Yes	13 (26%)	18 (36%)	
Frequency	No	37 (74%)	32 (64%)	= 0.106*
	Once	10 (20%)	10 (20%)	
	Twice	3 (6%)	6 (12%)	
	Thrice	0 (0%)	2 (4%)	
Mean ± SD		0.32 ± 0.02	0.56 ± 0.1	= 0.041*
Period from discharge to 1st re-admission by days:				= 0.044**
Mean ± SD		71.92 ± 9.2	61.39 ± 10.6	
Period from discharge to 2nd re-admission by days:				= 0.184**
Mean ± SD		38.33 ± 10.7	44.13 ± 5.6	

*Chi-square Test analysis was used to compare the difference in proportions

**T-test analysis was used to compare the mean difference between the two groups

Table 4. Frequency distribution of causes of re-admission of study vs. control groups (n=100)

Parameter	Study group (n = 13)	Control group (n = 18)	P-value*
Uncontrolled diabetes mellitus	3 (23.1%)	4 (22.2%)	= 0.470
Uncontrolled blood pressure	2 (15.4%)	0 (0%)	= 0.036
Recent Coronary insult	0 (0%)	0 (0%)	-----
Hyperlipidaemia	0 (0%)	3 (16.7%)	= 0.031
Anaemia	2 (15.4%)	3 (16.7%)	= 0.584
Drug Non-compliance	3 (23.1%)	5 (27.8%)	= 0.114
Bad dietary habits	2 (15.4%)	5 (27.8%)	= 0.048
Infection (Chest or Other)	1 (7.7%)	1 (5.6%)	= 0.756
Worsening left ventricular function	1 (7.7%)	4 (22.2%)	= 0.032
Hypoxemia	0 (0%)	0 (0%)	-----
Ischemia	1 (7.7%)	5 (27.8%)	= 0.041
Others	3 (23.1%)	7 (38.9%)	= 0.038

*Chi-square Test analysis was used to compare the difference in proportions

Table (1): Shows that the majority of the patients in both study and control groups were males (74 %), (76%) with a mean age (55.6± 10.4), (55.8 ± 10.7) years, married (84%), (92%), educated (50%), (58%) and unemployed (86%), (76%) respectively.

Table (2): Shows that the highest percentages of the patients' risk factors for heart failure in both study and control groups were smoking (56%),(64%), diabetes

(44%),(38%), ischemic heart disease (36%),(46%) and hypertension (42%),(28%) respectively and there is no a statistically significant difference between study and control groups regarding their risk factors for heart failure disease.

Table (3): Demonstrates that there was a statistically significant difference between study and control groups regarding their mean frequency of re-admission with a p-value of (0.041) and period from discharge to 1st re-admission with a p-value of (0.044) while there was no statistically significant difference regarding period from discharge to 2nd re-admission between the two groups.

Table (4): Shows that the highest percentages of causes for readmitted patients in both study and control groups were drug non-compliance (23.1%), (27.8%), diet poor compliance (15.4%), (27.8%), uncontrolled diabetes mellitus (23.1%), (22.2%), ischemia (7.7%), (27.8%), anemia (15.4%), 16.7), and worsening left ventricular function (7.7%), (22.2%) respectively. Also, there was a statistically significant difference between readmitted patients in study and control groups regarding Uncontrolled BP with a p-value of (0.036), Hyperlipidaemia with a p-value of (0.031), Diet Poor compliance with a p-value of (0.048), Worsening LVF with a p-value of (0.032), Ischemia with a p-value of (0.041) and others with a p-value of (0.038).

Discussion:

The present study deals with a critical issue in our daily practice and that issue affects markedly on the health care resources giving the importance of performing strategies that aimed at reducing readmission rate for HF patients through nursing education program.

From the researcher's review of literatures, it was found that HF continues to increase in prevalence with a great impact on morbidity and mortality in addition to patients who suffer from HF often experience a decline in health resulting in

frequent readmissions and debilitating symptoms. Thus, strategies aimed at reducing readmissions are essential. Evidence suggests hospital readmissions for HF can be reduced ⁽¹⁸⁾. This vulnerable population and the epidemic growth of heart failure have created a significant interest in assisting in heart failure disease management through nursing education program with the goal of reducing cyclic readmissions to the hospital.

As regarding to demographic characteristics of the study sample, the majority of the patients in both study and control groups were males with a mean age (55.6 ± 10.4), (55.8 ± 10.7) years respectively, married, educated. This study finding was in line with a study by **(Bhosale et al., 2020)** who found that the majority of his study sample were males; mean age 55.8 years. Also, agree with **(Agostinho et al., 2019)** who found that the majority of his study sample were males. Also, agree with **(Rahim et al., 2018)** who found that Most subjects of both study and control groups were married. Also, agree with **(Al-Sutari and Ahmad, 2017)** who found that Approximately two-third of the participants in the intervention and the control groups were married and had secondary education or less.

According to the present study, the highest percentages of the patients' risk factors for heart failure in both study and control groups were smoking, diabetes, ischemic heart disease and hypertension in both study and control groups. This result agrees with **(Benjamin et al., 2019)** who found that hypertension and diabetes mellitus were associated with higher incidence of HF. Also, agree with a study by **(Sulaiman et al., 2015)** which revealed that Co-morbid conditions were common with heart failure, particularly hypertension, diabetes mellitus, Coronary artery disease, and hyperlipidemia.

Also, agree with **(Yang et al., 2015)** who proved that the strongest independent associations for incident HF were coronary artery disease, diabetes

mellitus, followed by hypertension and smoking. Also, agree with **(Masri et al., 2018)** who found that from the total cohort, more than half had coronary artery disease and a high percentage of patients had multiple comorbidities, including hypertension and diabetes mellitus.

Heart failure readmissions can be preventable and inappropriate education and programs before discharge and lack of patients' follow up after discharge are counted as the most important patients' readmission factors after discharge **(Paul., 2008)**. The results of the present study that was done with the emphasis on both mentioned factors showed that patient's education before discharge along with giving educational booklet and their telephone follow up after discharge cause significant decrease in the level of hospital clinical readmissions as there was a statistically significant difference between study and control groups regarding frequency of their re-admission with a p-value of (0.041) and period from discharge to 1st re-admission. This result supported by a study by **(Bott., 2016)** who found that there is a significant association between enhanced patient education and reduced readmission. The control group had a larger percentage 53.3% of readmissions than the intervention group rate of 7.1%.

Also, agree with a study by **(Shojaee et al., 2013)** who found that patient's education before discharge and telephone follow up after discharge decrease readmission level significantly. After 3 months of follow-up there was significant difference for hospital, clinical and physician's office readmissions between groups. Also, agree with **(Rahim et al., 2018)** who demonstrate that there are significant differences between two groups on reducing hospital readmission rates in the intervention group. Moreover, at the end of 1st, 2nd and 3rd months of the intervention, there is considerable reduction in the rates of hospital readmission.

Also, a study by (**Adib-Hajbaghery et al., 2013**) found that continuous care through patient education before discharge and telephone follow up could significantly reduce the rate of post discharge readmissions of patients with HF. But there is a study by (**Kollia et al., 2016**) which disagree with this study findings as he found that there was no significant reduction in readmission, hospitalization and mortality rates of patients after implementing this educational process. Also disagree with a result of a study by (**Al-Sutari & Ahmad; 2017**) that showed that the differences between the control group and the intervention group regarding frequency of hospitalizations, and frequency of deaths were not statistically significant.

The result of this study found that the highest percentages of causes for readmitted patients in both study and control groups were drug non-compliance, diet poor compliance, uncontrolled diabetes mellitus, ischemia, anaemia and worsening left ventricular function in both study and control groups. Also, there was a statistically significant difference between study and control groups regarding uncontrolled blood pressure, hyperlipidaemia, diet poor compliance, worsening left ventricular function and ischemia. This study findings was supported by a study by (**Annema et al., 2009**) who observed that from the reasons for readmission worsening HF and other factors, such as comorbidity, nonadherence, and nonoptimal medication, were important contributing factors.

Also, this study findings were in line with a study by (**Arora et al., 2017**) who found that from causes of increased readmissions were diabetes mellitus and anaemia. Also, agree with (**Chamberlain et al., 2018**) who found that from the factors that significantly affecting readmission rates anaemia and diabetes. Also, (**Wang et al., 2019**) who found that from causes of frequent readmissions was a history of ischaemic heart disease.

Limitations of the study:

Time constraints for this particular study were a limiting factor. As this study was developed as a study for doctoral dissertation, a time line for completion was to be adhered to. If a more open-ended duration was possible, the number of participants would have been larger, possibly increasing the power of the study. So, it would be worthwhile to repeat the study with a larger sample size to verify the effect of the intervention is reproducible.

Conclusion:

Finally, we concluded that patient education during hospitalization and post discharge telephone follow-up interventions conducted by nurses could significantly reduce the rates of readmissions to the hospital.

References:

1. **Adib-Hajbaghery M., Maghaminejad F., and Abbasi A. (2013):** The role of continuous care in reducing readmission for patients with heart failure. *Journal of caring sciences*, Vol. (2), No. (4), p.p. 255-267.
2. **Agostinho J. R., Gonçalves I., Rigueira J., Aguiar-Ricardo I., Nunes-Ferreira A., Santos R. and André N. (2019):** Protocol-based follow-up program for heart failure patients: Impact on prognosis and quality of life. *Revista Portuguesa de Cardiologia (English Edition)*, Vol. (38), No. (11), p.p. 755-764.
3. **AlHabeeb W., Akhras K., AlGhalayini K., Al-Mudaiheem H., Ibrahim B., Lawand S., and Bader F., (2018):** Understanding Heart Failure Burden in Middle East Countries: Economic Impact in Egypt, Saudi Arabia and United Arab Emirates. *Value in Health*, Vol. (21), No. (1), p.123.

4. **Al-Sutari M. M., and Ahmad M. M. (2017):** Effect of educational program on self-care behaviors and health outcome among patients with heart failure: an experimental study. *International journal of evidence-based healthcare*, Vol. (15), No. (4), p.p. 178-185.
5. **Annema C., Luttik M. L. and Jaarsma T. (2009):** Reasons for readmission in heart failure: perspectives of patients, caregivers, cardiologists, and heart failure nurses. *Heart & Lung*, Vol. (38), No. (5), p.p. 427-434.
6. **Arora S., Lahewala S., Virk H. U. H., Setareh-Shenas S., Patel P., Kumar V. and Deshmukh A. (2017):** Etiologies, trends, and predictors of 30-day readmissions in patients with diastolic heart failure. *The American Journal of Cardiology*, Vol. (120), No. (4), p.p. 616-624.
7. **Benjamin E.J., Muntner P., Alonso A., Bittencourt M.S., Callaway C.W. and Carson A.P. (2019):** American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics-2019 update: a report from the American heart association. *Circulation*; Vol. (139), No. (10), p.p. 56-528.
8. **Bhosale K. H., Nath R. K., Pandit N., Agarwal P., Khairnar S., Yadav B., & Chandrakar S. (2020):** Rate of Rehospitalization in 60 Days of Discharge and It's Determinants in Patients with Heart Failure with Reduced Ejection Fraction in a Tertiary Care Centre in India. *International Journal of Heart Failure*, Vol. (2), No. (2), p.p. 131-144.
9. **Bott K. A. (2016):** Effect of Enhanced Patient Education on Patient Satisfaction and 30-Day Readmission Rates after Cardiac Arrhythmia Ablation, Doctoral Dissertations. 1319. University of Connecticut, p.55.

10. **Chamberlain R.S., Sond J., Mahendraraj K., Lau C.S., and Siracuse B.L. (2018):** Determining 30-day readmission risk for heart failure patients: the readmission after heart failure scale, *International Journal of General Medicine*, Vol. (11), p.p. 127-141.
11. **Cleland J., Trotman-Beasty A., Atkin P., Crundall A., Castiello T., and Antony R., (2011):** Education for patients with heart failure: rationale, evidence, and practical implementation, *Medicographia.*; Vol. (33), p.p. 409-418.
12. **Deek H., Skouri H. and Nouredine S. (2016):** Readmission rates and related factors in heart failure patients: A study in Lebanon, *Collegian* Vol. (23), No. (1), p.p. 61- 68.
13. **Giamouzis G., Kalogeropoulos A. and Georgiopoulou V. (2011):** Hospitalization epidemic in patients with heart failure: risk factors, risk prediction, knowledge gaps, and future directions. *J Card Fail.*, Vol. (17), No. (1), p.p. 54-75.
14. **Hsieh, F. Y., Bloch, D. A., and Larsen, M. D. (1998):** A simple method of sample size calculation for linear and logistic regression. *Statistics in Medicine*, Vol.17, p.p. 1623-1634.
15. **Kollia Z.A., Giakoumidakis K., and Brokalaki H. (2016):** The effectiveness of nursing education on clinical outcomes of patients with heart failure: A systematic review, *Jundishapur J Chronic Dis Care. (InPress)*, Vol. (5), No. (2), p.35881.
16. **Kristiansen A., Svanholm J., Schjødt I., Jensen K., Silén C., and Karlgren K., (2017):** Patients with heart failure as co-designers of an educational website: implications for medical education, *Int J Med Educ.*; Vol. (8), p.p. 47–58.

17. **Liou H., Chen H., Hsu S., Lee S., Chang C. and Wu M. (2015):** The effects of a self-care program on patients with heart failure, *Journal of the Chinese Medical Association* Vol. 78, p.p. 648-656.
18. **Masri A., Althouse A.D., McKibben J., Thoma F., Mathier M., Ramani R. and Mulukutla S.R. (2018):** Outcomes of heart failure admissions under observation versus short inpatient stay. *Journal of the American Heart Association*, Vol. (7), No. (3), p. 79.
19. **Moertl D., Altenberger J., Bauer N., Berent R., Berger R., Boehmer A., Ebner C., Fritsch M., Geyrhofer F., Huelsmann M., Poelzl G. and Stefenelli T. (2017):** Disease management programs in chronic heart failure, *Wien Klin Wochenschr*, Vol. 129, p.p. 869–878.
20. **Ofstad A., Atar D., Gullestad L., Langslet G. and Johansen O. (2018):** The heart failure burden of type 2 diabetes mellitus—a review of pathophysiology and interventions, Vol. (23), No. (3), p.p. 303–323.
21. **Page R.L. and Lindenfeld J. (2012):** The comorbidity conundrum: a focus on the role of non-cardiovascular chronic conditions in the heart failure patient. *Curr Cardiol Rep.*, Vol. (14), No. (3), p.p. 276-284.
22. **Pandey A., Golwala H., Xu H., DeVore A.D., Matsouaka R., Pencina M., Kumbhani D.J., Hernandez A.F., Bhatt D.L., Heidenreich P.A., Yancy C.W., de Lemos J.A. and Fonarow G.C., (2016):** Association of 30-Day Readmission Metric for Heart Failure Under the Hospital Readmissions Reduction Program with Quality of Care and Outcomes, *Jacc: heart failure* Vol. (4), No. (12), p.p. 935 - 946.
23. **Paul S. (2008):** Hospital Discharge Education for Patients with Heart Failure: What Really Works and What Is the Evidence? *Critical Care Nurse.*; Vol. (28), No. (2), p.p.66-82.

24. **Rahim B., Alireza M., Jaleh N., and Ali R. (2018):** The Role of Continuous Care Model on Hospital Readmission of Patients with Heart Failure: A randomized Controlled Clinical Trial. *Health Science Journal*, Vol. (12), No. (6), p.p.1-7.
25. **Rasmusson K., Flattery M., and Baas L. S. (2015):** American Association of Heart Failure Nurses position paper on educating patients with heart failure. *Heart & Lung: The Journal of Cardiopulmonary and Acute Care*, Vol. (44), No. (2), P.P. 173-177.
26. **Shively M.J., Gardetto N.J., Kodiath M.F., Kelly A., Smith T.L., Stepnowski C., Maynard C. and Larson C.B. (2013):** Effect of patient activation on self-management in patients with HF. *Journal of Cardiovascular Nursing*, Vol. 28, No. 1, p.p. 20-34.
27. **Shojaee A., Nehrir B., Naderi N., and Zareyan A. (2013):** Assessment of the effect of patient's education and telephone follow up by nurse on readmissions of the patients with heart failure. *Iran J Crit Care Nurs*, Vol. (6), No. (1), p.p.29-38.
28. **Sulaiman K., Panduranga P., Al-Zakwani I., Alsheikh-Ali A. A., AlHabib K. F., Al-Suwaidi J., and Ridha M. (2015):** Clinical characteristics, management, and outcomes of acute heart failure patients: observations from the Gulf acute heart failure registry (Gulf CARE). *European Journal of Heart Failure*, Vol. (17), No. (4), p.p.374-384.
29. **Voigt J., Sasha John M. and Taylor A., (2014):** A reevaluation of the costs of heart failure and its implications for allocation of health resources in the United States, *Clin Cardiol*; Vol. (37), No. (5), p.p. 312–321.
30. **Wang N., Gallagher R., Sze D., Hales S. and Tofler G. (2017):** Predictors of Frequent Readmissions in Patients with Heart Failure, *Heart, Lung and Circulation*, Vol. (25), No. (2), p.p.118- 119.

31. **Wang N., Gallagher R., Sze D., Hales S. and Tofler G., (2019):** Predictors of Frequent Readmissions in Patients with Heart Failure, *Heart Lung Circ.*, Vol. (28), No. (2), p.p. 277-283.
32. **Xexemeku F., Singh A., Adjepong Y. A. and Zarich S. (2014):** Predictors of Early Readmission in Heart Failure Patients in an Inner-City Community Hospital, *World Journal of Cardiovascular Diseases*, Vol. 4, No. (9), p.p. 476-482.
33. **Yang H., Negishi K., Otahal P., and Marwick T. H. (2015):** Clinical prediction of incident heart failure risk: a systematic review and meta-analysis. *Open heart*, Vol. (2), No. (1). e000222.
34. * IBM_SPSS. Statistical Package for Social Science. Ver.21. Standard version. Copyright © SPSS Inc., 2011-2012. NY, USA. 2012