Readmission Risk Factors in Patients after myocardial infarction using the minimum data set

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Abstract

Background

- Readmission is important not only as a representation factor of quality, but also because of its high cost and taking up an inconsistent share of hospital care costs. The purpose of this study was to determine the affecting factors of readmission of patients after myocardial infarction using the minimum data set.

Methods

- This is a descriptive cross-sectional and retrospective study. The research environment was hospitals affiliated with Shiraz University of Medical Sciences. A total of 320 hospitalized patient files with myocardial infarction with the code I21, admitted between April 2011 and October 2019 were reviewed. After comprehensive review of the literature and sources, 55 criteria were extracted and two expert panel sessions were held. Univariate and multivariate analysis were used to investigate the relationships between different factors and readmission. Next, variables that were significant in univariate analysis were entered into the regression model.

Results

- After convening the expert panel, 32 criteria were finally approved. The highest rate of readmission occurred in the first 30 days after first admission with 84 cases (24%) and according to the present study the most common clinical (cardiovascular) factors affecting readmission were acute coronary syndrome with 104 cases (59.43%), atherosclerosis with 92 cases (52.57%), infarction in other areas with 89 cases (50.86%), anterior myocardial infarction with 88 cases (50.29%), congestive heart failure with 18 cases (10.29%).

Conclusions-

This study showed that underlying and clinical factors affecting readmissions in a developing country include acute coronary syndrome, anterior myocardial infarction, coronary artery stenosis/chronic ischemic heart disease, chronic obstructive pulmonary disease, hypertension at first admission and high amount of sodium in the first admission.

Background

Acute myocardial infarction (AMI) is one of the most common causes of hospitalization in industrialized countries, often due to atherosclerosis and coronary thrombosis (1). And has the largest financial impact on health care (2). In Iran, the first and most common cause of death in all ages and both genders, are cardiovascular diseases, especially coronary artery diseases. Out of a total of 700 to 800 daily deaths,

317 cases are due to cardiovascular diseases, and 166 cases are due to a myocardial infarction that occurs over the age of 35 years. In 2013, there were 71,300 readmissions in the United States within 30 days of discharge due to acute myocardial infarction, which has increased hospital costs by more than $ 1 billion (4). Establishing balance between cost of effectiveness and providing high quality care to patients is a constant challenge for modern health care systems (5). In general, hospital readmission is defined as a hospital admission for a specified period of time (7, 15, 30, 60, 90 days or even up to one year), after the initial admission and discharge (6, 7). However, the most common time for readmission is 30 days after discharge (7).

Readmissions are important first because they may be linked to the treatment of acute myocardial infarction. Second, readmission may be due to inadequate management of other comorbidities during the patient's stay in the hospital (5). Many factors such as age over 70, severity and recurrence of disease, failure to fully implement care and treatment procedure, underlying diseases, hospital infections, length of admission in intensive care unit, etc. (8) are involved in readmission. However understanding is the most important factor and essential for improving disease management, because a thorough understanding of the subject contributes to the development of strategies to prevent the possibility of readmission and thus help save money and resources (9). Since medical costs have been rising rapidly, readmission has led to high economic costs, disruption of family processes, being far from work environment, and increased provision of health services (12). Prospective studies have shown that 12 to 75 percent of readmissions can be prevented through education patterns, pre-discharge preparation, and home care provision (13). Evaluating the effectiveness of measures taken to achieve predetermined goals is a key measurement tool for evaluating health care results, including readmission (12). There are some limitations to measuring the effectiveness in health care systems. One of the ways of overcoming these restrictions, is to define criteria for healthcare status, with the aim of comparing its performance against its status (11). Therefore, the management of hospitals and healthcare authorities of the country should focus more on optimal utilization of hospital beds, the clinical effectiveness, cost-effectiveness, and do further investments in this field. They should also pay more attention to the most important indicator of assessing the healthcare abilities of the wards, which is the analysis of the number of readmissions and hospital mortality rate (8). The minimum Data Set or MDS is a conceptual framework that includes information about the effectiveness of the provided cares is the basis for acquiring the indexes of effectiveness (10) This dataset enables proper communication between care providers and facilitates timely decision making for managers by providing a minimum set of variables related to people's health status including demographic data, clinical and patient care plan (11).

Given the results and statistics obtained from readmission analysis in similar studies that illustrate the challenges of this phenomenon all over the world, it is imperative to further understand the phenomenon of readmission and its related factors (12). Therefore, the present study aims to determine the effective factors in the readmission of patients after myocardial infarction using a minimum data set.

Methods

Variable selection

This is a descriptive, cross-sectional and retrospective study. Readmission Period In this study, has been defined as one-year period (6, 7) after the discharge of patient from hospital. After a conclusive review of the literature and sources, 55 criteria were extracted in three groups (Appendix). Group one: Demographic factors including two criteria. Group two: Cardiovascular factors Including 11 Criteria. Group three: underlying factors including 42 criteria. Criteria were assessed using a data collecting form based on available information sources and surveyed using expert panel method with 5 specialists in two sessions with a two weeks interval. The decision criterion for accepting each component was that if the collective agreement on the data element was less than 50%, the component would be removed from the proposed minimum data set. Items for which there was collective agreement of more than 75% were included in the minimum data set. The cases that had a collective agreement between 50 and 75 percent were surveyed again with newer cases that were recommended by the specialists in the second meeting. If the agreement was 50%, considering the amount of odds ratio, they were surveyed again in the second round. After the first session, 34 out of 55 criteria were approved. In the second session after examining 34 approved criteria in the first session, 32 cases were approved. (Group one: demographic factors including two criteria. Group two: Cardiovascular factors including 10 criteria. Group three: underlying factors including 20 criteria) (Table 1).

Inclusion criteria were the diagnosis of myocardial infarction confirmed by a cardiologist based on the ICD10 book with codes I21.0, I21.1, I21.2, I21.3, I21.4, and I21.9. Exclusion criteria were readmissions due to selected cases (such as performing coronary vessels subcutaneous interventions) as requested by hospital authorities. Data collection tool, the information form, consists of two sections: Sect. 1, case number, date of birth, gender, date of first admission, date of discharge after first admission, main diagnosis at discharge after first admission, date of readmission, cause of readmission, and the number of readmissions. In the second part the variables in the minimum data set were surveyed, and in case of qualitative variables such as congestive heart failure, coronary artery stenosis, etc. questions were in the form of (have/not have) and for quantitative variables such as age, blood sugar, sodium, blood pressure, etc. the amount of variable was surveyed. Qualitative variables were collected from admission by diagnosis of myocardial infarction and readmission of patients. If the patient had been admitted before admission with a diagnosis of myocardial infarction, previous illnesses were considered as medical background. The research environment were hospitals affiliated to Shiraz University of Medical Sciences including Alzahra Heart, Faghihi, Ali Asghar and Kowsar. The records of patients with myocardial infarction diagnosed between April 2011 and October 2019 were reviewed. Using the results of the reference article and the rule of thumb, the sample size was determined based on the number of variables multiplied by 10.

Since 32 variables were finalized by cardiologists, a sample size of 320 files was estimated, out of which 160 files were related to readmitted patients (case) and 160 were non-readmitted patients (control). Sampling from non-readmission files were done by simple random sampling method and from files with readmissions due to their low count, sampling was done by census method.

Statistical Analysis

In this study, we first provide descriptive statistics for the variables under study. Then, univariate and multivariate analysis were used to investigate the relationships between different factors and readmission. At first, univariate analysis was performed. In this regard, the frequency difference between readmission/non-readmission in different groups was evaluated for the qualitative/ordinal variables using chi-square test. For continuous quantitative variables, t-test was used to examine the mean difference between the two groups with and without readmission. Next, variables that were significant in univariate analysis were entered into the regression model. Logistic regression was used for qualitative (binary) dependent variable. Analyses were performed with Excel and Stata software.

Table 1
approved criteria (finalized)

Factors	Row	Variable	Type
Demographic factors	1	Male sex	**qualitative nominal**
	2	Aged > 65 (age 65, continuous)	**quantitative continuous**
Cardiovascular Factors	3	History of CABG surgery	**qualitative nominal**
	4	Congestive heart failure	**qualitative nominal**
	5	Acute coronary syndromes	**qualitative nominal**
	6	Anterior AMI	**qualitative nominal**
	7	Other location of AMI	**qualitative nominal**
	8	Angina pectoris/old AMI	**qualitative nominal**
	9	Coronary atherosclerosis/other chronic ischemic heart disease	**qualitative nominal**
	10	Heart failure, Peripheral edema, CHF on radiograph, rales, gallop rhythm, or S3	**qualitative nominal**
	11	Valvular and rheumatic heart disease	**qualitative nominal**
	12	Arrhythmias	**qualitative nominal**
Underlying factors	13	Cerebrovascular disease	**qualitative nominal**
	14	Stroke	**qualitative nominal**
	15	Vascular or circulatory disease	**qualitative nominal**
	16	Diabetes and DM complications	**qualitative ordinal**
	17	Renal failure	**qualitative nominal**
	18	End-stage renal disease or dialysis	**qualitative ordinal**

19	COPD	**qualitative nominal**
20	Disorders of fluid\electrolyte\acid-base	**qualitative nominal**
21	Metastatic cancer and acute leukemia	**qualitative nominal**
22	Iron deficiency and other\unspecified anemias and blood pressure	**qualitative nominal**
23	Hypertension	**quantitative discrete**
24	Shock	**qualitative nominal**
25	Time since chest pain started 6–12	**quantitative discrete**
26	Time since chest pain started >12	**quantitative discrete**
27	BUN	**quantitative discrete**
28	Creatinine	**quantitative discrete**
29	ST-segment elevation	**qualitative nominal**
30	Left bundle-branch block	**qualitative nominal**
31	Second/third-degree heart block	**qualitative nominal**
32	Sodium < 130	**quantitative discrete**

Results

The subjects were in the age range of 31–92 years with a mean age of 63.5 years. The majority of patients (69.43%) were male and 53.71% were under 65 years of age. The highest readmission rate occurred in the first 30 days of first admission with 84 cases (24%). According to the statistical results of the Chi-square test with 95% confidence level, readmission had no significant difference for patients over and below the age of 65 years. (P-value = 1.0) Also, no significant difference was found in male and female readmission rates. (P-value = 0.7)

Based on the results of chi-square test (univariate), variables of acute coronary syndrome (p-value = 0.0 and x^2 = 72.3), coronary artery stenosis/chronic ischemic heart disease (p-value = 0.0 and 0.9). 20 (x^2 =

20.9), chronic obstructive pulmonary disease (p-value = 0.03, x^2 = 4.6) had a significant difference with readmission, which showed a significant increase in readmission rate due to the above diseases.

According to the independent t-test, there was a significant difference in mean blood pressure at first admission (p-value = 0.01) and mean sodium level at first admission (p-value = 0.03). Hence, the blood pressure and sodium levels at first admission were higher in patients with readmission compared to those without readmission. But according to the results, there wasn't a significant difference seen between the two groups in terms of variables such as blood sugar (p-value = 0.7), urea (p-value = 0.3) and creatinine (p-value = 0.9) variables, in the first admission.

Then, a multivariate logistic regression was performed. In this model, the significant variables of chi-square test and t-test were entered into the model by backward method and were shown in the output of variables that influenced the readmission rate (Table 2).

Table 2
The odds ratio of readmission in patients with myocardial infarction diagnosis in hospitals under study in the province of Shiraz using logistic regression

Cause of Readmission	Odds Ratio	Standard Error	Statistic z	P value	95% Confidence Rate	
					Minimum	Maximum
Acute coronary syndrome	12/51	3/95	8/00	0/00	6/74	23/25
Anterior myocardial infarction	2/06	0/58	2/55	0/01	1/18	3/59
Coronary atherosclerosis	3/93	1/16	4/65	0/00	2/21	7/00
Chronic obstructive pulmonary disease	20/23	22/98	2/65	0/01	2/18	187/50
Sodium level at first admission	1/03	0/04	0/83	0/41	0/96	1/12
Blood pressure at first admission	1/01	0/00	1/26	0/21	0/99	1/02
Consonant	0/00	0/00	-1/37	0/17	1/68e-08	23/12

According to the values obtained from Table 2, the chance of readmission in people with acute coronary syndrome is 12.51 times higher (CI: 73.6–23.2 95% and p-value = 0.0).

Another variable is coronary atherosclerosis, which has a significant effect on readmission. According to the results of the study, with progression of coronary atherosclerosis the chance of readmission of patients after myocardial infarction was 3.93% higher (CI: 2.2-7.0 95% and p-value = 0.0).

Also, according to the results, chronic obstructive pulmonary disease increased the odds of readmission by 20.2 times (p-value = 0.01 and 95%CI:2.187-1.5) anterior myocardial infarction (p-value = 0.01 and

95%CI/: 1.1–3.5), blood pressure at first admission was 1.00 times (p-value = 0.21 and 95%CI: 0.9-1.0) and the amount of sodium at first admission increased 1.03 times (p-value = 0.41 and 95%CI: 0.9–1.1).

Discussions

The results of this study showed that 24% of the patients under study were readmitted from the first 30 days of discharge. This is largely consistent with the study of Kumar Dharmarajan et al. 2017, Corey Fehnel et al. 2015, Jeremiah Brown et al. 2014, Sheida Sajjadi et al. 2016, and Nahid Hatam et al. 2014.

Regarding the study of readmission rates, there have been numerous studies abroad and in Iran that have suggested different rates for readmission. The difference between the results may be due to different factors such as admission unit, clinical and demographical conditions of patients and etc. (8)

According to the present study, 94 cases (53.72%) were under 65 years of age with the highest readmission rate. The results of this study are inconsistent with any of the studies. There is no credible evidence to justify the discrepancy of this study with previous studies, but the cultural differences, background knowledge and information of patients, individual characteristics of the subjects under study, mentality and judgment of people towards health centers, livelihood and economical status will be among those factors.

Maybe further studies with larger sample size can determine the relationship between age and readmission. There may also be a different result from reviewing readmission in a longer span of time (14).

According to the present study, the highest rate of readmission was found in 123 male cases (69.43%). In 2018, Ronald Chamberlain et al reported more readmissions in men (15). In a 2014 study by Jeremiah Brown et al., The mean age of patients discharged for acute myocardial infarction was 78.4 with 51.6% male, which is consistent with this study (16). On the other hand, this is inconsistent with the study of Menal Etemadi et al. (2017), in which 54% of patients were female and 46% were male (17). This discrepancy may be because men have a higher risk of having coronary artery disease than women before the age of menopause, but after menopause, the risk of coronary artery disease increases (18).

The results of this study on the most common clinical factors (cardiovascular) affecting readmission are largely consistent with the studies done by Chun Shing Kwok et al (2017), which claims, the most common cardiac causes are acute coronary syndrome (17.1%), unstable angina (11.6%) and heart failure (9.8%)(5). Also, Cashel O'Brien et al (2017) reported ischemic heart disease and heart failure (4), which is also in line with this study.

Also in the Lucia Fernandez et al (2017) study, most readmissions were related to cardiovascular causes (60%) and heart failure were the most common cause (34%) (20). And Harlan et al. (2011) reported that the most primary diagnosis at the time of discharge for readmissions, was heart failure (17%), acute myocardial infarction (7%), coronary atherosclerosis (4%), pneumonia (3%), and acute kidney failure (3%).

However, in the 2010 Heydari et al. study, readmission rates of cardiac patients were 57% and the highest frequency was in patients with valvular heart disease and heart failure (13). But in the current study, factors such as acute coronary syndrome, anterior myocardial infarction, coronary atherosclerosis, chronic obstructive pulmonary disease, sodium levels at first admission, and blood pressure level at first admission were affective.

The most common underlying factors (comorbidities) effective in readmissions reported in this study are largely consistent with the study of Ronald Chamberlain et al. (2018). She referred to factors such as renal failure, chronic pulmonary disorder, diabetes, depression, and electrolyte fluid dysfunction after admission to patients with CHF (15). However in other studies such as Mahek Shah et al. In 2018 other factors including infection (11.7%), respiration (9.2%), injury/burn/ poisoning related to conditions (7.8%), Gastrointestinal/hepatic biliary/pancreas (6.9%) and genital system disorders (4.6%) have been cited as the most common causes of non-cardiovascular disease (19). Also, Chun Shing Kwok et al. (2017) have mentioned for various reasons for non-cardiac readmissions including gastrointestinal infection (4.3%), gastrointestinal problems (4.9%), bleeding (3.7%), dizziness, Syncope or falls (3%) and pulmonary embolism (4.2%). (5) Since most of the above studies have been conducted in developed countries that depending on the type of culture and lifestyle are at different levels than developing countries the results could be different from the research done in Iran.

In developed countries, more has been done in terms of culturing and providing post-discharge education to patients and informing patients about the importance of pursuing treatment which can affect the effective factors in readmission.

Conclusions

The results of the present study showed the clinical and contextual factors, some of which are adjustable, increase the risk of readmission for patients that have acute myocardial infarction and in conclusion, evaluation and analysis of these factors and objective intervention for these patients, seems to be the proper approach to lower the readmission rate. Although this study aimed to identify patients with risk of readmission, but further studies for identification of other effective factors in readmission patients seems to be necessary.

According to the results, it is recommended that people receive necessary education through public media about the risk factors of myocardial infarction, which include inactivity, obesity, smoking, age over 60 years. It is also important that people know about the early symptoms of a heart attack and how to treat these patients (22).

Identifying risk factors is a tool to reduce the risk of cardiovascular disease by reducing modifiable risk factors and making better therapeutic decisions by more accurately determining the status of all risk factors. Reducing the risk factors is the primary clinical action is for reduction of mortality and morbidity of cardiovascular disease. Epidemiological studies help identify risk factors to reduce the risk of cardiovascular disease by adopting appropriate strategies. Given the importance of the disease and the

risk factors for cardiovascular disease, preventing its spread is a multifaceted task and in addition to the people who have a key role to play, authorities should actively participate and cooperate too. It is also recommended to change the lifestyles, encourage healthy diet, limit alcohol consumption, control blood pressure, quit smoking, and avoid stress and pay attention to exercise (23).

Researchers argue that proper post-discharge follow-up that requires close hospital affiliation with the patient in the post-discharge period can significantly reduce the frequency of hospital admissions of the patients. During these follow-up, the patient's potential and actual problems are discovered by the treatment and care team, providing an opportunity to apply the right method of patient management (24).

Abbreviations

AMI:Acute Myocardial Infarction; COPD:Chronic Obstructive Pulmonary Disease; DM:Diabetes mellitus; BUN:Blood Urea Nitrogen; CABG:Coronary Artery Bypass Graft.

Declarations

Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

This study was carried out in keeping with the guideline approved by the Local Ethical Committee of the Shiraz University of medical sciences for patient records (ref. number IR.SUMS.REC.1398.694). According to this guideline researchers with an approved proposal by Shiraz University of Medical Sciences were allowed to use the data collected during patient’s hospitalization.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions:

SA, AA and MB. Drafting of study protocol: SA. Sample collection: SA, AA and MB. Interpretation of results: SA. Drafting of the initial manuscript: AA. Revision of the manuscript: MB. Statistical analysis: All authors read and approved the final manuscript.

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References

1. Krumholz HM, Lin Z, Drye EE, Desai MM, Han LF, Rapp MT, et al. An administrative claims measure suitable for profiling hospital performance based on 30-day all-cause readmission rates among patients with acute myocardial infarction. Circulation Cardiovascular quality outcomes. 2011;4(2):243–52.
2. Agrawal Y, Patri S, Chhatrala H, Joseph S, Saltiel F, Kalavakunta JK, et al. Demographic parameters related to 30-day readmission of patients with pulmonary embolism: Analysis of 650,819 hospitalizations. Int J Cardiol. 2016;221:152–4.
3. Niakan M, Paryad E, Shekholeslam F, Kazemnezhad Leili E, Assadian Rad M, Bonakdar HR, et al. Self Care Behaviors in Patients after Myocardial Infarction. Journal of Holistic Nursing Midwifery. 2013;23(2):63–70.
4. O'Brien C, Valsdottir L, Wasfy JH, Strom JB, Secemsky EA, Wang Y, et al. Comparison of 30-Day Readmission Rates After Hospitalization for Acute Myocardial Infarction in Men Versus Women. The American journal of cardiology. 2017;120(7):1070–6.
5. Kwok CS, Wong CW, Shufflebotham H, Brindley L, Fatima T, Shufflebotham A, et al. Early Readmissions After Acute Myocardial Infarction. The American journal of cardiology. 2017;120(5):723–8.
6. Yu S, Farooq F, Van Esbroeck A, Fung G, Anand V, Krishnapuram B. Predicting readmission risk with institution-specific prediction models. Artif Intell Med. 2015;65(2):89–96.
7. Hatam N, Askarian M, Khamzade F, Jafari P, Bastani P. Readmission Risk Factors in Patients of General Surgery Wards in Shiraz Hospitals: Applying LACE Index as a Predictive Indicator. Academic Journal of Surgery. 2015;2(3–4):33–8.

8. Sadjadi S, Alimohammadzadeh K, Hosseini SM. ASSESSMENT OF PREVALENCE OF, READMISSION IN ADMITTED WARD OF TEHRAN OIL COMPANY'S HOSPITAL IN 2016. The J Urmia Nurs Midwifery Fac. 2018;16(1):1–11.
9. Arab m, Eskandari Z, Rahimi A, pourreza A, Dargahi H. Reasons for patients'. readmission in Tehran University of Medical Sciences Hospitals Hospital. 2010;9(1):43–56.
10. Hosseini A, Moghaddasi H, Jahanbakhsh M. Designing minimum data sets of diabetes mellitus: Basis of effectiveness indicators of diabetes management. Health Information Management. 2010;7(3):330–40.
11. darabi m, Gholami Parizad delpisheha, E, nematollahi m, Sharifian R. Designing the Minimum Data Set for Iranian Children' Health Records. journal of ilam university of medical sciences. 2016;24(1):114 – 25.
12. Bathaei A, Ashktorab T, Zohari Anbuhi S, Ezati Z, Alavi Majd H. Use of Logistic Regression Model in Surveying Effective Causes of Readmission in Patients with Congestive Heart Failure. Qom Univ Med Sci J. 2012;6(1):60–5.
13. Heydari A, Ziaee ES, Ebrahimzade S. The Frequency of Rehospitalization and Its Contributing Factors in Patient with Cardiovascular Diseases Hospitalized in Selected Hospitals in Mashhad In 2010. Quarterly of Horizon of Medical Sciences. 2011;17(2):65–71.
14. Soltani L, Ravari A, Sabzevari S. Relationship between prodromal (warning) symptoms and referring time in patients with myocardial infarction. Iranian Journal of Cardiovascular Nursing. 2016;4(4):22–31.
15. Chamberlain RS, Sond J, Mahendraraj K, Lau CS, Siracuse BL. Determining 30-day readmission risk for heart failure patients: the Readmission After Heart Failure scale. Int J Gen Med. 2018;11:127.
16. Brown JR, Chang CH, Zhou W, MacKenzie TA, Malenka DJ, Goodman DC. Health system characteristics and rates of readmission after acute myocardial infarction in the United States. Journal of the American Heart Association. 2014;3(3):e000714.
17. Etemadi M, Vaziri Nasab H, Ebraze A, Khorasani E. Prediction of Patient Readmission by LACE Index components at Cardiac Care Unit of an Iranian Hospital: A Cohort Study. Evidence Based Health Policy Management Economics. 2017;1(4):243–52.
18. Abedi H, Bik Mohammadi S, Abdeyazdan G, Nazari H. A SURVEY ON THE THE, LIFESTYLE OF THE HEART DESEASE PATIENTS AFTER DISCHARGE FROM HOSPITAL IN URMIA SEYYED ALSHOHADA IN 1391. Journal of Nursing Midwifery Urmia University of Medical Sciences. 2014;11(12):0-.
19. Shah M, Patel B, Tripathi B, Agarwal M, Patnaik S, Ram P, et al. Hospital mortality and thirty day readmission among patients with non-acute myocardial infarction related cardiogenic shock. Int J Cardiol. 2018;270:60–7.
20. Fernandez-Gasso L, Hernando-Arizaleta L, Palomar-Rodríguez JA, Abellán-Pérez MV, Pascual-Figal DA. Trends, causes and timing of 30-day readmissions after hospitalization for heart failure: 11-year population-based analysis with linked data. Int J Cardiol. 2017;248:246–51.

21. Rana S, Tran T, Luo W, Phung D, Kennedy RL, Venkatesh S. Predicting unplanned readmission after myocardial infarction from routinely collected administrative hospital data. Aust Health Rev. 2014;38(4):377–82.
22. Amani F, Hajizadeh E, Hoseinian F. Survival rate in MI patients. Koomesh. 2008;9(2):131–8.
23. Shahsavari S, Nazari F, Karimyar Jahromi M, Sadeghi M. Epidemiologic study of hospitalized cardiovascular patients in Jahrom hospitals in 2012–2013. Iranian Journal of Cardiovascular Nursing. 2013;2(2):14–21.
24. DADGARI ZOLFAGHARIA, EFFECT OF TELEPHONE FOLLOW-UP CARE ON REHOSPITALIZATION FFARSIZ. AND DEPRESSION IN PATIENTS UNDERGOING OPEN HEART SURGERY IN A SELECTED MILITARY HOSPITAL. 2017.