

Examining the relationship between illness perception, adherence to medication regimen and readmission in patients with heart failure

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ABSTRACT

Background: In spite of the advancement in heart-failure treatment, readmission of patients with this illness still imposes a heavy burden on the health system by increased treatment and care costs. However, half of the hospitalizations in these patients are preventable. **Purpose:** The purpose of this study was to examine the relationship between illness perception (IP), medication adherence (MA), and readmission during 30 days after discharge in chronic heart-failure patients. **Methodology:** The study was descriptive-correlational where 360 patients - with heart failure hospitalized in Shahid Madani Hospital in Tabriz - were selected using convenient sampling method. The tools used in the study were demographic questionnaire, Brief Illness Perception Questionnaire (BIPQ), Medication Adherence Report Scale (MARS), and readmission study 30 days after discharge by telephone and receiving a “yes” or “no” answer. Data was analyzed in SPSS13. Data analysis was done using independent t-test, Mann Whitney, ANOVA, Kruskal Wallis, Pearson correlation coefficient and Spearman-Brown correlation coefficient. Significance level was P less than 0.05. **Results:** The mean and standard deviation (SD) of IP and MA were 45.45 (9.33) and 23.91 (2.68), respectively. Overall, the results showed a significant direct correlation between IP and MA ($r=0.196, P<0.001$). There was a significant direct correlation between some aspects of IP - including illness control, treatment control, and concern over illness and IP with MA. There was, however, a significant negative relationship between the emotional manifestations of the illness such as anger, fear, discomfort, and depression with MA ($r=-0.17$ and $P=0.001$). There was no significant relationship between IP ($p=0.199$) and MA ($p=0.602$) with readmission 30 days after discharge ($P>0.05$). **Conclusion:** Nurses can use the results of this study to identify patients at high risk of non-adherence to medication regimens and readmission. Suggestion for future studies include conducting similar studies in multiple places with a larger sample size and using objective tools to examine MA in patients with heart failure and qualitative studies of the factors affecting IP, MA, and readmission.

Keywords: Heart failure, IP, MA, readmission.

Introduction

Problem statement:

The prevalence of heart failure in the adult population of developing countries is estimated to be 1-2% [1]. Evidence shows that heart failure has become a global epidemic with

growing prevalence [2]. The prevalence of heart failure is predicted to reach 46% by 2030 and become an important physical problem throughout the world in the future [3]. The prevalence of this illness in the adult population is from one to two percent, six percent in people over 65 years of age, and 10% in people over 75 [4]. A study in 2014 stated that heart failure in Iran is higher than other countries in the region and probably the world, and factors such as age, stroke, type 2 diabetes, hypertension and various illnesses in the cold season are its causes. The study has stated the prevalence of heart failure in Iran as 8%, which is more than its prevalence in Asian countries such as Japan, China and Malaysia [5]. Heart failure imposes heavy burdens on the health system by increasing treatment costs, hospitalization time, readmission, and outpatient visits [2]. Evidence has shown that training self-care behaviors, such as MA and diets can play a significant role in

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reducing readmission in the early stages ^[6] and if the patients adhere to their medication regimen, hospitalization can be reduced by half ^[7]. One of the important strategies focused on in many studies on chronic illness management is MA. MA can have a significant effect on reducing symptoms, preventing recurrence, reducing readmission, reducing costs, improving patients' recovery, and creating self-care role in them ^[8]. However, the opposite of MA is non-adherence to medication, which is a potential changeable behavior, and understanding the factors affecting MA can help develop strategies to increase MA and prevent negative outcomes such as readmission ^[3]. Among all patients with cardiovascular illness, the patients with heart failure have the most readmission, and non-adherence to medication can end in increased hospitalization time, more frequent visits and readmission ^[9]. Evidence suggests that 29% of heart failure patients do not concede to MA ^[10]. Many studies have been conducted to root out the causes and factors contributing to non-adherence to treatment in the world, showing many reasons for this problem ^[11-13]. According to the World Health Organization (WHO), the factors affecting MA are categorized into five categories: patient factors, socioeconomic factors, treatment factors, factors related to health system and communication factors ^[14]. Among these factors, the ones related to the patient are the most important ones, with the most important one being the patient's IP, play a very important role in MA ^[15]. IP includes the patient's knowledge of the illness, his/her beliefs about illness and treatment, and the result of patient efforts to organize, analyze and interpret all kinds of information about the illness and its related symptoms ^[16]. IP can be affected by factors such as health behaviors and psychological distresses of the patient ^[17]. IP is discussed in the self-regulation framework called the common sense model ^[17]. According to this model, the patients can actively understand their illness and its symptoms, how to respond to it the best way, evaluate the impact of illness-management strategy, and revise their perception ^[3]. Evidence suggests that IP and the efforts to improve MA for patients can be very important in reducing the rate of readmission ^[3]. Evidence also suggests a potential relationship between person's IP and MA in heart illness ^[18]. Despite the above points, the results of various studies do not always confirm the common sense model ^[19, 20]. Regardless of the limitations of the studies (such as the low sample size, and so on), cultural factors ^[19], and the type of questionnaires used can contribute to the results ^[21]. As no studies have been conducted on the relationship between IP and adherence to treatment with readmission in Iran, and the results of studies conducted abroad are not sufficient ^[3, 21], conducting such a study seems necessary. Considering the mentioned issues and non-adherence in patients with heart failure - due to factors such as aging, complicated, and costly drugs ^[22] - MA in these patients requires proper management ^[3]. Moreover, the growing trend of cardiovascular illnesses in Iran and the variety of these illnesses in different cultures and countries ^[23] and efforts to reduce the rate of hospitalization in patients with heart failure, it is a very important challenge that health systems always face ^[24].

Furthermore, considering that this illness is a complicated health problem, with the advancement of medical science the medications may get complicated as well ^[25], and the rate of prescription is high in Iran ^[26], there is the possibility of a lack of background information on patients' IP and MA, especially regarding drugs, on which the patients' improvement and treatment depend. Hence, using a research approach, we started to examine the relationship between IP, MA and readmission (the first unplanned hospitalization due to heart failure or exacerbation of heart failure within 30 days after discharge) in patients with chronic heart failure.

Methodology:

Study plan

The present study was descriptive-correlational to examine the relationship between IP, MA and the rate of readmission in patients with heart failure.

Research setting and sample size:

According to a similar study ^[27], where 12.3% readmission was obtained, using the formula for determining the sample size for ratios, considering the rate of readmission ($\alpha=0.05$, $p=0.123$) and the acceptable error rate 3.5%, the sample size was determined 342. Finally, considering the 10% drop rate, the sample size reached 360.

$$n = \frac{z^2 \times p \times q}{d^2} = \frac{(1.96)^2 \times 0.123 \times 0.887}{(0.35)^2} = 342$$

Inclusion criteria were primary or secondary heart failure diagnosis according to cardiologist's diagnosis, willingness to participate in the study, ability to use drugs independently, access to the phone, establishing verbal communication, patients of both genders and treated with heart failure treatment drugs. Exclusion criteria were unwillingness to participate in the study, patients with cognitive problems (score 9 or higher in the Short Blessed Test ^[28]) and sensory disorders, malignant liver failure, renal failure (creatinine more than 3 mg/dl), chronic obstructive pulmonary illness and neuromuscular disorders requiring frequent hospitalization, deafness and blindness, staying in the nursing home.

Procedures:

As the conditions of these patients makes access to all members of the study impossible, convenient sampling method was used, and data collection was done using attending research centers and controlling inclusion criteria in the subjects, and submitting the questionnaires to them. After approving the plan and obtaining the necessary permissions from the research deputy of the Faculty of Nursing and Midwifery of Tabriz and the relevant authorities and before the start, the ethical permission of the research was obtained from the Regional Committee for Ethics and Research of Tabriz University. Eligible subjects were selected based on the inclusion criteria. Conscious consent was obtained with the help of the researcher. Prior to obtaining

consent, the subjects were given information about the study and its objectives. The subjects' questions were answered, and they were assured that their information would remain confidential and could exit the study at any time and at any stage of the study. Short Blessed Test was used to assess the cognitive impairment of patients and the subjects scoring 9 and above were excluded from the study. Short Blessed Test is a six-item tool used to examine cognitive impairments. It has been shown that this tool shares 95% sensitivity and 65% specificity with the Mini-Mental State Exam (95% sensitivity and specificity of 65% as well as optimal overlap with the Mini-Mental State Exam). A quick review of cognitive impairment is possible by this tool [28]. Telephone numbers of subjects were received for telephone communication. The research aide responsible for data collection then gave the questionnaires to the subjects. The questionnaires were completed by the subjects themselves if they were literate and received after 15 to 30 minutes; and for the illiterate ones, the questions were read and their responses were recorded. Subjects with trouble in understanding some of the questions were given some explanations. Thirty days after the completion of the questionnaire, the subjects were asked for information on readmission, and in those responding positively, they again visited the patient and the patient's case was reviewed.

Tools:

Demographic profile questionnaire

The questionnaire contains the individual characteristics of the subjects: gender, marital status, occupation, education level, monthly income level, living with the spouse, parents, children and alone, duration of heart failure, smoking, hookah, and using drugs and alcohol, having hypertension, diabetes, hyperlipidemia, and the causes of readmission. The research team prepared the questionnaire and the researcher aide responsible for data collection collected the data.

BIPQ

The questionnaire has nine items, each of which examining one dimension of IP: eight items are 10-point visual analogue scale. Scores obtained ranging from 0 to 10. The type of answer to each question is tailored to the type of question. For instance, an item that measures the symptoms of an illness asks questions "How much do you experience symptoms from your illness?" The subjects should respond from "no symptoms at all" getting to "many severe symptoms" getting 10. In this study, the tool was co-ordinated with the study and the word "illness" was replaced with heart failure. The first item measures the consequences of the illness. The second item is illness period, the third item is related to personal control, and the fourth is control therapy. The fifth item is for illness diagnosis. The six item measures the degree of integrity of a person against an illness. The seventh question has to do with emotional responses to the illness, and the eighth item measures anxiety concerns, which reflects a series of cognitive and emotional perceptions. The ninth item relates to perceptions of the causes of the illness. The aggregation of scores from the patient's

responses reflects the degree to which the person understands the illness. The answer to question 9 is divided into groups of stress, inheritance and lifestyle, graded accordingly. A higher score reflects a higher perception of the illness from the patient's point of view. To examine the five components of illness perception - illness identification, results, duration of illness, control/treatment and the causes of the illness - Leventhal self-regulatory model was used (1984). Test-retest reliability and optimal content validity of this tool have been examined in chronic illnesses such as asthma, renal illnesses and type 2 diabetes [29]. The scores obtained range from 0 and 83. This tool was used in patients with inpatient and outpatient care and has been successfully implemented on the telephone [30]. The reliability, validity of the Farsi version of this questionnaire has been verified and localized by Bazzazian and Besharat [31]. As the tool has one item, test-retest was used for its reliability, and α was 0.79 in this study.

MARS

Five-item self-report MARS questionnaire was used to examine MA. This tool is designed based on a 5-option Likert Scale from 1 = often to 5 = never. The minimum score is 5 and the maximum score is 25. A higher score on a scale indicates higher adherence. The reliability of internal consistency in patients receiving corticosteroid has been verified at alpha coefficient of 0.81 [32], in patients with essential hypertension treated with antihypertensive drugs Cronbach's alpha coefficient of 0.77 [33], and in patients with heart failure with an alpha coefficient of 0.73 [3]. In Ohm and Anderson, the construct validity of this tool was confirmed by examining the degree of adherence in two instruments with a correlation coefficient ($r=0.53$) [34]. This tool was also tested in this study by test-retest method and its Cronbach's alpha was 0.87.

Thirty-Day Hospital Readmission

In this study, readmission was the first unplanned hospitalization due to heart failure or exacerbation of heart failure within 30 days after discharge, and by telephone contact with the patient 30 days after discharge. It was examined by the calling the patient 30 days after discharge and asking about the unplanned admission in the past 30 days due to exacerbation of heart failure, its response was determined with "yes/no." For subjects whose answers were "yes," the diagnosis was confirmed during admission by reviewing the hospital records.

Data analysis:

Data analysis was done in SPSS13. First, the normal distribution of the scores of the variables (IP-MA) was evaluated by studying skewness, kurtosis, histogram graph, and Kolmogorov Smirnov statistical tests, where the distribution of IP scores was normal and the distribution of scores for MA was not normal. Statistical tests including independent t-test, Mann Whitney, ANOVA, Kruskal-Wallis, Pearson correlation coefficient and Spearman Brown correlation coefficient were then used. Data were analyzed in SPSS13 at a significance level of less than 0.05.

Results:

The demographic characteristics of the subjects in tables 1 and 2 indicate that the mean (standard deviation) of the subjects' age was 65.25 (13.57). Most of the subjects were female (59.4%), married (85.3%), homemakers (57.9%), illiterate (60.7%) and living with their spouses (84.2%). The mean and SD of the illness duration were 6.72 and 6.65. The results in Table 1 show that female patients, homemakers and patients with no history of smoking, hookah, and alcohol have a significantly higher understanding of the risk of illness. The results in Table 1 also show that widowers and low-income patients have less MA. Moreover, non-smoker patients, without a history of hypertension and a habit of exercising in life have significantly better MA. Table 2 also shows that increase in the duration of the illness significantly increases IP ($r = 0.146$, $P = 0.006$).

From among the subjects, 40 (11.1%) subjects were readmitted 30 days after discharge due to complications of heart illness and 10 (2.8%) died within 30 days of discharge (Table 3).

The total mean (standard deviation) of IP was 45.45 (9.33) out of a maximum score of 80, based on which one could state that subjects had a relatively high IP. The lowest scores was related to the cognition of the individuals of their illness with a mean (SD) of 2.85 (2.15) and the control of individuals over their illness with a mean (SD) of 3.72 (2.43). The highest score was the patient's perception of the illness continuation with a mean (SD) of 6.76 (3.23) and the effect of treatment on the improvement of the illness with a mean (SD) of 6.74 (2.63) (Table 4). Patients considered stress with a frequency of 44.3% and an inheritance with a frequency of 18% as the most and least causes of the illness.

The mean (SD) of MA in the subjects was 23.91 (2.68) from the maximum score of 25. The majority of subjects (92.5%) have "never decided to stop one of their medications," and 84.5% of them had not "forgotten their medication." The lowest mean (SD) was related to "not forgetting to use medicines 4.71 (0.74), and the highest was related to the decision to stop one of the medications 4.87 (0.51) (Table 5).

There was a significant relationship between IP and MA ($r = 0.196$, $P < 0.001$). This means that by increasing IP, MA rate significantly increased. There was a direct correlation between illness control, control of treatment, concern about the illness, and recognition of the illness - as the dimensions of IP, and MA. This means that with increase in the patient's IP in these dimensions, MA increased. However, there was an inverse relationship between emotional manifestations of the illness, such as anger, fear, discomfort and depression and MA, meaning that with increase in the manifestation of negative emotions, MA would decrease (Table 6).

The results on the relationship between IP and readmission in Table 7 showed no significant correlation between IP and readmission after 30 days ($P = 0.199$). However, the subjects with readmission had a better IP (47.20 versus 45.17). In comparing the dimensions of IP between the two groups of patients with and without readmission, the results showed that

patients with readmission had a significantly higher mean score ($P < 0.05$) in the two following items. "How much do you experience symptoms from your illness?" How much your illness emotionally affects you? (e.g., does it make you angry, worried, upset or depressed?).

The results in Table 1 also showed no significant relationship between MA and readmission ($p = 0.662$). Additionally, there was a significant relationship between the two items: "I have decided to discontinue one of my medications" and "I use my medication less than my doctor's recommendation" with readmission. This means that people who did not have readmission had significant arbitrary less stoppage of medication ($P < 0.001$) and prescribed doses ($P = 0.008$).

Discussion:

The aim of this study was to investigate the relationship between IP, MA and readmission in patients with chronic heart failure. Studies in the dimensions of IP in this study showed that the lowest score was related to the cognition of individuals from their illness and the control of individuals over their illness, and the highest score was patients' understanding of the persistence of the illness and the effect of treatment on the recovery of the illness. As the highest percentage of patients in this study were illiterate (60.7%) and the lowest mean (44.82) of IP belongs to them and as recognition of the illness is a part of the IP Questionnaire, it seems that the level of education is a factor in better understanding of the illness. In other words, the level of education seems to improve the recognition process of the illness by identifying the aggravating factors. It even seems that this causes better information about the illness. According to the common sense model, recognizing the illness leads to self-management and illness control^[35, 36]. According to this model, if the recognition of the illness is low, the control of individuals for their illness is expected to be low. Moreover, considering that the lowest percentage of people (2.5%) had a higher monthly income than their expenditures in this study, and a high percentage of patients had an even income and expenditure and less income than expenditure, it seems that patients have difficulty in providing different drugs in heart failure, even regardless of the role of illness recognition. They cannot afford the drugs they need as one of the ways to control the illness, and consequently, they obtained lower illness control score.

Regarding the continuation of the illness, heart failure is a chronic illness, and in ideal conditions, it is possible to provide medical advice and dietary recommendations to slow down the process of exacerbation. Thus, it seems that the presence of the illness and its symptoms for a long time, even in the absence of recognition of the chronic nature of the illness for a condition. Regarding the effect of treatment on recovery, it seems that due to long-lasting degrees and the symptoms of the illness, even the slightest effect of treatment on the relief of symptoms can be considered significant by the patients. In the study of the dimensions of IP, the dimensions of control over illness, control therapy, concern over illness and recognition of the illness were directly related to MA. Regarding illness control as mentioned,

drugs could play a role in controlling the symptoms of the illness. In terms of treatment control, those who control the illness through treatment are expected to be better suited because drug is also an important part of therapeutic control. Regarding concern, it seems that the concern is that the patient is serious about the condition understanding and recognizing and paying attention to their illnesses has recognized the importance of controlling it even limitedly with medications, and they seem to be able to show a high degree of adherence. Regarding the recognition of the illness, as indicated, the common sense model represents the recognition of the illness and, consequently, the creation of conditions for self-management and illness control^[35, 36]. As mentioned that medication also seems to be one way to control the illness, it is expected that recognition of the illness will bring about MA. Moreover, studies have shown that the emotional manifestations of the illness, such as anger, fear, discomfort and depression, reduce adherence. These negative emotions seem to affect MA negatively, which is the case in the present study. It seems that knowledge of the illness and understanding of its long-term complications can lead to negative emotions in patients, but besides it seems that the lack of better control of the illness and symptoms associated with it can also cause negative emotions in patients. The very point seems to make the patient hopeless of improving the condition with medication and reduce MA. However, it should be noted that mental conditions vary from person to person: a person may even accept trivial effects of medication as a treatment, and another person individuals may expect ideal conditions from medication and in lack of it avoid MA. This results in negative manifestations and depression and even lack of hope for medications. In general, there is a positive relationship between IP and MA, indicating that increased IP leads to an increased MA. Although IP was higher in patients without readmission for 30 days of discharge, there was no significant difference in the relationship between perception and readmission. Perhaps non-adherence to medication should be studied in longer periods to find a correlation. In addition, there was no statistically significant relationship between MA and readmission. Patients with readmission had a significant higher mean scores in two items: "How much do you experience symptoms from your illness?" How much your illness emotionally affects you? (e.g., does it make you angry, worried, upset or depressed?). In feeling the symptoms of the illness, as heart failure has multiple symptoms and symptoms can be mild or severe, it seems that these people may consider the symptoms of the illness life threatening, even though they are mild and controllable by the person and go to the treatment centers for readmission. In other words, the ability and awareness of individuals and their sensitivity to the symptoms of the illness and its control seem to be different. In the case of negative emotional symptoms, negative emotions such as stress also appear to worsen the conditions of the patients, and depression causes non-adherence with the medication, and failure to treat as a factor can exacerbate the symptoms and the likelihood of readmission. In the studies conducted, the results showed a significant

relationship between the two items: "I decided to discontinue one of my medications" and "I use my medicines less than the physician's prescription" with readmission. In fact, people who had arbitrary discontinuation of medication and taking less than the prescribed dose of medication had more readmission. In this case, as mentioned, medication is a factor in controlling the exacerbation of the illness, which, in turn, can contribute to the reduction of hospitalization. There are some points regarding taking medications: the decision to cut off one of the medications is important because it is possible that stopping medication, such as digoxin, for example due to the complications that as the main drug, worsen the patient's conditions. Even if the patient cuts off a drug like beta-blocker, it will negatively affect the control of the illness and change the conditions for readmission. As patients with a better IP have better MA, it appears that readmission rates are significantly lower, whereas in this study, readmission did not have much correlation with IP and MA. It seems that just high IP and MA are not enough to reduce the rate of readmission. It seems that the patients know heart failure to the extent that they perceive MA as a way of controlling their symptoms, but just MA does not seem to be the only way to control the illness. MA and proper and timely drug administration can be only one part of the process of controlling heart failure. However, it seems that other factors are involved here, such as observing nutritional principles, lifestyle appropriate to heart failure, patients' mental conditions, and even the recognition of the interactions of drugs used in the illness with other drugs that the patient may use in the event of other illnesses. Heydari et al. (2010) reported that stressors, non-adherence of medication, heavy activity, and inappropriate food intake are among the main causes of readmission in cardiac patients^[37]. In this study, subjects also identified stress as a major contributor to the illness. It seems that even by considering PI and MA, illness severity is a factor in readmission because Schwarz et al. (2003) reported that the interaction of severity of heart illness and functional status are as a predictor of readmission in patients with heart failure^[38]. In addition, in heart failure, certain drugs and different drug groups are used, where MA may exist in certain drugs, such as digoxin, but not in some drugs, such as furosemide due to urinary problems^[3]. On the other hand, for example, nitrate medicines are used less due to dizziness and headache. However, in MA questionnaire, the overall adherence of the patients is examined, which seems to be difficult to answer the questions^[3]; consequently, they show high compliance. In other words, in spite of the advice given to different drug groups, the patients may take medicines that cause less complication as the main drug for controlling heart failure and consider adherence to it as the answer to the question. In IP questionnaire, in general, the symptoms of the illness are asked, whereas patients do not seem to know the exact symptoms of their illness precisely. As a result, it will be difficult to respond if the recognition of the minor symptoms can also be effective in creating better MA and reducing readmission. Leventhal et al. (2010) stated that individuals with more than one physical illness may not properly recognize the symptoms^[16]. In their

study of heart failure patients, Horowitz et al. (2004) found that few patients used their medications for the treatment of symptoms such as shortness of breath and leg edema ^[39]. Consequently, with a general probability of considering the illness, the response to the IP will exist. Rajpura and Nayak (2014) concluded in their study that IP was followed by treatment in patients with high blood pressure ^[18]. Shiah et al. (2011) observed that IP directly affects MA and indirectly affect hypertension through the control of the illness and the causes ^[40]. Heydari et al. (2015) found a significant relationship between the knowledge and awareness of the illness and MA in cardiac patients ^[41]. The results of these studies are in line with this study. Nevertheless, there are inconsistent studies as well. Saarti et al. (2016) concluded that IP does not significantly correlate with MA in hypertension patients, but blood pressure control and satisfaction with treatment ^[42]. In this study, a different questionnaire (Morrisky) was used to examine MA, and the sample size was 117, which seems inadequate. Perhaps these factors are effective in achieving different results. It appears that patients expect to control the symptoms of the illness, and the experience of the symptoms can cause dissatisfaction with the treatment and possibly negative feelings (e.g. depression and fear) leading to non-adherence to medication. In this study, the increase in negative emotions reduced MA. As heart failure does not have a definitive treatment and its goal is to control the progression of the illness and there is the likelihood of occurrence of symptoms despite MA, patients are expected to respond negatively to this problem and this can be followed by reverse relationship with MA. However, in general, the results of this study are not consistent with our study. Leventhal et al. (1998) stated that the experience of symptoms could lead to non-adherence to medication ^[43]. In Turrise (2015), there was no significant relationship between IP and MA. Individuals believing that they had a higher personal control showed less adherence. Control therapy was significantly correlated with readmission 30 days after discharge ^[3]. In this study, it seems that the sample size of 96 people is insufficient to state a significant relationship between IP and MA. Besides the sample size and the questionnaires used, it seems that several factors can affect the outcomes of IP and MA and readmission and their relationship. For example, Rajpura and Nayak, despite the final sample size of 117 achieved a significant relationship between IP and MA ^[18]. It also seems that under different conditions, the effect of some factors can be more on the result of the study. Thus, factors such as personality traits, community-based cultures, education levels and locus of control should also be considered. Some studies have identified personal control with high MA ^[35, 44], some self-control studies with low MA ^[45, 46], and they seem to be involved in personal control of these factors. Gellad et al. (2011) reported that factors such as illness awareness, educational level, cognitive functions, and side effects of drugs could affect treatment ^[21]. Kucukarslan (2012) concluded that age, illness, and culture were factors that could affect IP ^[19]. One of the limitations of this study is sampling from one training center, which reduces its generalizability. The

convenient sampling method was used in this study, resulting in likelihood of volunteers' bias. As the samples are not randomly selected, the statistical results found should be considered with caution. Due to the cross-sectional nature of the study, changes in variables over time cannot be studied. Suggestions for further studies is random sampling in several places with a larger sample size and using objective tools to examine MA in patients with heart failure to increase the generalizability of the results. Additionally, it is suggested to study the factors affecting IP, MA, and readmission referred to in qualitative studies.

Conclusion:

Given the discussion, it seems that nurses can use this information and tools to identify patients' IP, MA, and use them in completing the patient's history and take an important step in planning patient care and solving their problems. In addition, as IP and MA were correlated with no correlation to readmission in this study, the nurses can help patients in identifying the potential issues that could lead to readmission besides helping them in IP and MA.

Conflict of interests: There are no conflicts of interest.

Ethical Considerations: This study was registered by the Ethics Committee of Tabriz University of Medical Sciences at No. 77821/5 / 5-25 / 7/95. The researcher obtained conscious consent of the subject. The patients were assured that their information would remain confidential, and they can exit the study at any stage.

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Table 1: Characteristics of subjects

Variables		Frequency (percent)	Mean(SD) of MA	P value	Mean (standard deviation) of IP	P value
Variables	Sub-group	Frequency (percent)	Mean (standard deviation) of MA	P	Mean (standard deviation) of IP	P
Gender	Man	146 (40.6)	23.66 (3.14)	*0.173	43.58 (8.83)	*0.001
	Woman	212 (59.4)	24.07 (2.31)		48.87 (9.44)	
	Single	7 (1.9)	24.28 (1.25)		46.42 (7.16)	
Marital status	Married	307 (85.3)	24.04 (2.36)	****0.034	45.53 (12.160)	***0.705
	Widow(er)	46 (12.8)	22.95 (2.96)		56.23 (10.05)	
	Homemaker	209 (57.9)	24.07 (2.33)		48.45 (12.44)	
Employment	Worker	11 (3)	22.45 (4.63)	***0.403	44.27 (10.6)	***0.004
	Employee	11 (30)	24.18 (2.40)		38.28 (8.98)	
	Self-employed	93 (25.8)	23.64 (3.16)		44.63 (13.60)	
	Unemployed	14. (3.9)	23.09 (1.73)		49.28 (12.79)	
	Retired	22 (6.1)	24.09 (2.97)		46.13 (11.90)	
Educational level	Illiterate	219 (60.7)	23.68 (2.78)	***0.147	44.82 (9.54)	***0.241
	Less than high school diploma	100 (27.7)	24.30 (2.19)		46.50 (8.87)	
	High school diploma	27 (7.5)	24.11 (2.77)		45.51 (9.18)	
	BS/BA	11 (3.1)	25.00 (0.00)		49.63 (9.48)	
	MS/MA	3 (0.8)	22.33 (4.61)		51.00 (4.58)	
Monthly income	Income less than expenditure	128 (35.6)	22.37 (2.98)	*** 0.018	45.50 (9.79)	***0.466
	Income equal to expenditure	22 (61.7)	24.21 (2.45)		45.40 (9.01)	
	Income more than expenditure	9 (2.5)	24.00 (2.64)		49.33 (10.5)	
Living with	Spouse	304 (84.2)	24.03 (2.64)	***0.138	45.32 (9.41)	***0.564
	Parents	5 (1.4)	24.00 (2.31)		50.40 (9.09)	
	Children	33 (9.01)	22.90 (3.32)		45.93 (8.82)	
Smoking	Alone	17 (4.07)	23.61 (91.62)	**0.012	47.05 (9.120)	**<0.001
	Yes	91 (20.30)	23.09 (3.38)		42.40 (9.81)	
	No	269 (74.7)	24.17 (0.006)		46.60 (12.59)	
Hookah	Yes	25. (0.9)	23.65 (2.61)	**0.601	41.40 (9.60)	**0.021
	No	335 (93.1)	23.93 (2.69)		45.85 (9.25)	
Drugs	Yes	13 (3.6)	24.38 (2.21)	**0.517	44.76 (9.14)	**0.762
	No	347 (96.1)	23.89 (2.69)		45.57 (9.34)	
Alcohol	Yes	8 (2.2)	23.00 (3.02)	**0.332	38.75 (7.75)	**0.037
	No	352 (97.8)	23.93 (2.67)		45.69 (9.31)	
Exercise	Yes	43 (11.9)	24.67 (0.99)	**<0.001	48.13 (8.58)	**0.052
	No	317 (87.8)	23.80 (2.819)		45.18 (9.38)	
Hypertension	Yes	281 (77.8)	23.77 (2.79)	**0.046	45.61 (9.14)	**0.777
	No	79 (21.9)	24.37 (2.19)		45.27 (10.01)	
Diabetes	Yes	153 (42.5)	23.73 (2.91)	**0.278	45.80 (9.641)	**0.064
	No	207 (57.5)	24.04 (2.49)		45.34 (9.82)	
Hyperlipidemia	Yes	71 (19.7)	23.46 (3.32)	**0.190	46.66 (8.87)	**0.259
	No	289 (80.1)	24.02 (2.49)		45.26 (9.43)	

*Mann-Whitney, **t-test, ***ANOVA, **** Kruskal-Wallis

Table 2: Quantitative demographic characteristics and their relationship with IP and MA

Quantitative variable	Mean (SD)	Coefficient of correlation (significance level)	
		MA	IP
Age	65.25 (13.55)	-0.10 (0.051)	-0.03 (0.510)
Illness duration	6.65 (6.72)	-0.092 (0.081)	0.146 (0.006)

Table 3: Consequence of the disease in the subjects

	Frequency	Percent
Readmission and death		
No re-admission	310	85.9
Readmission	40	11.1
Death	10	2.8

Table 4: IP in subjects

IP questionnaire items	Mean (SD)	Min. mean score	Max. mean score
How much does your disease affect your life?	6.56 (2.61)	0	10
Do long do you think your illness last?	6.76 (3.23)	0	10
How much do you think you have control over your illness?	3.72 (2.43)	0	10
Do much do you think the treatment will help you to treat your illness?	6.74 (2.63)	0	10
How many symptoms do you feel?	5.67 (2.35)	0	10
How much do you worry about your illness?	6.67 (2.05)	0	10
How much do you think your knowledge of your illness is?	3.85 (2.15)	0	10
How much, emotionally, does your illness affect you? (For example, does it make you angry, worried, upset or depressed?)	5.58 (3.57)	0	10
Total	45.45 (9.3)	15	66

Table 5: MA in subjects

Items of MA	Never	Rarely	Sometimes	Usually and always	Mean (SD)
I forget my medication.	(5.84) 305	(4.4) 16	(8.7) 28	(3)11	(0.74)4.71
I change the dose of my medication.	(7.86) 313	(4.4) 16	(1.6) 22	(5.2)9	(0.67)4.76
I stop taking medications for a short time.	(4.88) 319	(9.3) 14	(5.5) 20	(9.1)7	(0.62)4.79
I have decided to cut one of my medications.	(5.92) 334	(3.3) 12	(9.1) 7	(9.1)7	(0.51)4.87
I take my medications less than my doctor's recommendation.	(5.89)323	(5.2) 9	(2.4) 15	(6.3)13	(0.68)4.78
Total					23.91 (2.68)

Table 6: Relationship between IP and MA in the subjects

Dimensions of IP	Coefficient of correlation (significance level) with MA
The effect of illness on life	0.033 (0.535)
Length of illness	-0.033 (0.535)
Control over the illness	0.19 (<0.001)
Treatment control	0.29 (<0.001)
Understanding the symptoms of the disease	0.54 (0.306)
Concerned about the disease	0.19 (<0.001)
Understanding the illness	0.25 (<0.001)
Emotional manifestations of disease (anger, fear, discomfort and depression)	-0.79 (<0.001)
Total IP	0.196 (P=0.001)

Table 7: The relationship between IP and readmission in the subjects

Variable	Mean and SD of IP by readmission		p. value
	Yes	No	
How much does your disease affect your life?	7.03 (2.71)	6.43 (2.58)	0.175
Do long do you think your illness last?	7.58 (3.194)	6.59 (3.266)	0.069
How much do you think you have control over your illness?	3.15 (2.547)	3.83 (2.40)	0.094
Do much do you think the treatment will help you to treat your illness?	6.58 (2.80)	6.78 (2.61)	0.648
How many symptoms do you feel?	6.33 (2.51)	5.54 (29.2)	0.044
How much do you worry about your illness?	6.55 (1.97)	6.65 (2.07)	0.763
How much do you think your knowledge of your illness is?	3.38 (1.84)	3.93 (2.19)	0.125
How much, emotionally, does your illness affect you? (For example, does it make you angry, worried, upset or depressed?)	6.63 (3.08)	5.43 (3.63)	0.047
Total	47.20 (8.85)	45.17 (9.42)	0.199

Table 8: The relationship between MA and its items with readmission in the subjects

Items of MA	Mean and SD of MA by readmission		p-value
	Yes	No	
I forget my medication.	4.60 (0.84)	4.7 (0.73)	0.311
I change the dose of my medication.	4.75 (0.54)	4.77 (0.68)	0.851
I stop taking medications for a short time.	4.85 (0.48)	4.79 (0.63)	0.588
I have decided to cut one of my medications.	5.00 (0.00)	4.85 (0.55)	<0.001
I take my medications less than my doctor's recommendation.	4.95 (0.31)	4.78 (0.69)	0.008
Total	24.15 (1.29)	23.91 (2.79)	0.602