Original Article

Psychometric evaluation of the health-seeking behavior scale based on Kroeger's model for elective cardiac interventions

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Abstract

Background: Coronary artery bypass graft surgery (CABG) is one of the two most commonly used interventions for Myocardial Reperfusion. Studies suggest that the existence and direction of the effect of the factors affecting health-seeking behavior depend on the context of each society. Thus, this study aimed to introduce and validate a tool for investigating the factors affecting the health-seeking behavior of patients requiring a cardiovascular intervention as a prerequisite for planning and policymaking.

Methods: By reviewing the literature and questionnaires previously used in the field of health-seeking behavior and the patient's decision-making process, a set of related questions was collected based on Kroeger's model variables. Ten content experts were requested to evaluate each item and then content validity ratio (CVR) and content validity index (CVI) were calculated and used for instrument modification. Participants were included through a convenience sampling procedure. Exploratory factor analysis (EFA) and Confirmatory factor analysis (CFA) was used to assess construct validity. Cronbach's alpha coefficient was used to measure instrument reliability.

Results: Of the 142 participants, 79 (55.5%) were male. Through the validation process, a hierarchical model with four factors and 20 items with three error covariance (accounting for 63.06 present of outcome variable variation) was confirmed. Also, an examination of the four constructs obtained with Cronbach's alpha coefficient was more than 0.8 indicating acceptable reliability.

Conclusion: Findings suggest that the designed scale of health-seeking behavior based on Kroeger's model is a reliable and valid scale among the Iranian population.

Keywords: Coronary Artery Bypass; Decision Making; Myocardial Reperfusion; Factor Analysis

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Introduction

In most conditions in healthcare, patient's behavior cannot be ignored and it is clear that people's health decisions not only have important consequences for their health and quality of life, but also these decisions have inevitable effects on society and the health system (1). Population aging and the problem of chronic diseases in recent decades has devoted much attention to self-care, which involves the entire body of health decisions that individuals make for themselves and their families to maintain physical and mental well-being (2). Concerning cardiac interventions, some evidence suggests that different preferences and choices have been associated with different outcomes in patients requiring coronary artery bypass graft surgery (2, 3).

But identifying the factors that determine patients' behavior is not as simple as it seems. In many cases, patients do not actively choose. Different patient characteristics are involved in determining patients' willingness and ability to choose and when choosing, patients consider various characteristics of the structure, process, and outcome of service providers, along with the varying importance they attach to them (4).

Surprisingly, existing evidence does not confirm the effect of comparative quality information including information about the performance of hospitals, health professionals, or providers on patient decision-making (5). It is shown that people do not get information about the effectiveness and quality of care just from their experiences, but also from the experiences of others like neighbors and friends (6). Also, people are rooted in a social context that affects the process of understanding and using the information in a very complex way; therefore, it is suggested that the main attention should be paid to the health-seeking behavior of societies, rather than the behavior of individuals (7).

Moreover, studies on customer behavior have shown that in fact, individuals do not always behave completely rational (in a way that maximizes their utility). The ability of human beings in information-processing is limited and thus they use mental shortcuts called heuristics to overcome these limitations; this explanation is known as "bounded rationality" in behavioral economics. Such mental shortcuts, although very effective at times of rapid decision-making, are prone to significant cognitive errors that can lead to unhealthy behaviors (8).

Different approaches have been used to understand the complexities of health-seeking behavior that includes several theories as well as multiple models. One of the most well-known models is the socio-behavioral model or the Anderson model; the model groups factors influencing health behavior in three concepts or categories (predisposing, enabling, and need factors), in a logic sequence. Later, the understanding of health system factors was added to the model (9). The predisposing factors are indicative of the tendency for health services to be used, the enabling factors are resources in the family and the community and the third category is the need factors including the perceived need for health services. Also, health system factors include health policies, resources, and organizations as well as their changes over time (10).

Kroeger's model is a variant of the socio-behavioral model with almost the same explanatory factors but describes somewhat different three categories of factors all affected by perceived morbidity including predisposing factors (characteristics of individuals), characteristics of the disorder and characteristics of the service (including resources and organizing) (9). In Kroeger's model, factors such as age, gender, marital status, education, occupation, assets, and social network interactions (interaction with family, friends or community), and degree of cultural adaptation (the degree of exposure to another culture),

are classified in predisposing factors. Characteristics of the disorder include factors such as acute or chronic, severe, or trivial, expected benefits of treatment. Finally, the characteristics of the service are factors like accessibility, appeal, acceptability, quality, communication, and cost (11). The main advantages of these models are attention to material and structural factors, as well as the ability to work with statistical data (9).

Understanding the factors affecting patient choices and health-seeking behavior in the community is a starting point for health policy and planning (12). Also, studies suggest that the existence and direction of the effect of the factors affecting health-seeking behavior depend on the context of each society (13). And therefore, having an appropriate tool to assess important factors influencing health-seeking behavior can be considered as a prerequisite. The lack of appropriate measurement methods is a significant challenge in many studies, which reduces the ability to aggregate and compare the results of various studies (14). However, the purpose of this study was to prepare a valid tool to assess factors affecting the health-seeking behavior and provider selection for a cardiac intervention based on Kroeger's health care utilization model.

Methods

This cross-sectional study was carried out in three stages; instrument development, psychometric testing of the instrument, and instrument reliability measurement.

Instrument development

At first, by reviewing the literature and questionnaires previously used in the field of health-seeking behavior and the patient's decision-making process, a set of related questions were collected based on Kroeger's model variables. Some of the factors mentioned in the Kroeger's model were not considered by the researchers for this study; for example, the race factor was not considered in this study because of the absence of an important racial difference in the research population.

Questions related to demographic variables such as age, sex, marital status, household size, education, occupation, assets, that all belong to predisposing factors, and two additional questions about insurance coverage were adapted from the questionnaire of Bushehr Elderly Health (BEH) Program (15). To determine the acute or chronic nature of the disease (related to the characteristics of the disorder category), a question of the history of heart disease was used (16). To assess the severity of the disease, questions about the self-evaluated health status and health status evaluation done by the physician and also the effect of the disease on one's life were used; items related to this factor were adapted from the Persian questionnaire designed by Bahrami et al (14). Also, there was a question about the location of the hospital and a question about the type of hospital (public or private). This part of the questionnaire consisted of 25 questions. These questions were objective and did not require psychometric analysis.

To design questions related to the other variables of Kroeger's model required, three questionnaires including the Bahrami et al. 's questionnaire, the DECISIONS study questionnaire, and Schwartz's questionnaire, as well as research group's opinions, were considered (1, 14, 17). These questions related to nine variables selected from the Kroeger's model that had psychological aspects, therefore, these questions entered in the psychometric process. These variables included social network interactions (10 items), degree of cultural adaptation (3 items), expected benefits (3 items), accessibility (6 items), appeal (3 items), acceptability (2 items), communication (3 items), quality (3 items), and costs (2 items). A total of 35 items were selected for nine variables. Items had a 4-point Likert-type scale ranging from 1 (not at all) to 4 (too much).

Psychometric Testing of Instrument

Content validity and construct validity have been used to determine the validity of the scale.

Content validity

Content validity expresses how much selected items can reflect the desired concepts (18). Ten experts including three community medicine specialists, two health education professionals, two epidemiologists, one biomedical statistics expert, one healthcare management specialist, and one cardiologist were requested to collaborate in the evaluation of the instrument. To judge content validity, two approaches were used; content validity ratio (CVR) and content validity index (CVI). To calculate content validity ratio (CVR), the experts were asked to assess items using a 3-point Likert-type scale: 1=necessary, 2=useful but unnecessary, and 3=not necessary and similarly in order to calculate content validity index (CVI), they assessed items in terms of relevance, simplicity and clarity using ordinal 4-point Likert-type scales: 1=not relevant/simple/clear, 2=somewhat relevant/simple/clear, 3=quite relevant/simple/clear, and 4=very relevant/simple/clear. Ratings of 1 and 2 were considered "content invalid," whereas ratings of 3 and 4 were considered to be "content valid". Cut points for accepting content validity ratio (CVR) and content validity index (CVI) were 0.6 and 0.78 respectively (19, 20). Items whose content validity ratio was less than 0.6 were deleted if their content validity index was also inappropriate and otherwise modified.

Construct validity

The remaining questions for the nine factors, along with four questions about the perceived severity of the disease (because these four items were objective and also adapted from a validated questionnaire, did not require content validity assessment), were included for construct validity assessment. Construct validity was investigated by exploratory and confirmatory factor analysis.

Participants

In this stage, through a convenience sampling procedure, patients who had experienced any cardiac procedure provided that they were able to respond and did not refuse to participate, were included. Given the high rate of illiteracy and low literacy in the elderly population in Bushehr (15), the questionnaires were administered by trained interviewers. It is recommended that each variable subjected to factor analysis should have at least 5 to 10 observations (21); however, strict rules seems to be less necessary in this regard, as evidence has shown that a sufficient sample size is partly determined by the nature of the data (22). According to 29 items in this study (for construct validity), factor analysis was performed with 142 questionnaires (about 5 responders per item), which seemed to be sufficient.

Data analysis

Exploratory factor analysis (EFA) was used to extract latent variables and generate a model; EFA performed using the IBM SPSS version 23 (IBM SPSS, Armonk, NY, USA). In order to assess the suitability of the respondent data for factor analysis, Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy, and Bartlett's Test of Sphericity were used (23). All questions were entered using principal axis factoring method, and rotate factor criteria were set as follows: factor loading of 0.4 and more, the minimum eigenvalue of 1, and a maximum of 25 rotation iterations.

Confirmatory factor analysis (CFA) was used to confirm the model. The confirmatory factor analysis tests the observed variables with assumed factor structures and allows to compare various structures and select the best fit (24); four assumed models were tested: (*a*) one factor model in which total items are measuring an overall factor; (*b*) uncorrelated factor model in which items measure several factors, but these factors are not correlated;

(*c*) correlated factor model in which dimensions are interconnected, but do not measure a third variable; and (*d*) hierarchical model in which second-order factor can account for relations between factors indicating that the total score of the test can be calculated from the total score of the items. The hierarchical model is compatible with Kroeger's model as well as the model derived from the exploratory factor analysis. CFA was done by LISREL 8.8. Various fit criteria have been proposed to assess model fit in CFA, but no one is considered as a golden rule (25). In this study, to verify the model's fit, 6 indicators were used: Normed chi-square ($\chi 2/df$), Root Mean Square Error of Approximation (RMSEA), Adjusted Goodness of Fit Index (AGFI), Non-Normed Fit Index (NNFI) or Tucker-Lewis index (TLI) and Comparative Fit Index (CFI). Cut points for these indices were considered according to Hooper et al (26). In order to compare the competing models, Expected Cross-Validation Index (ECVI), was considered; In general, models that give the smallest values for this index are preferred over alternative models (18). T-values and modification indices (MI) were used to model modification. It is recommended to use these statistics to identify localized problems with fit and to avoid correlated error terms but based on theoretical Concepts (24).

Reliability Assessment

Cronbach's coefficient alpha was used to assess reliability for each factor separately. The acceptable value of this coefficient varies from 0.7 to 0.95 in different reports (27).

Table 1. Items included in the factor analysis

Factor		Items
Severity	1	What did you think before surgery/angiography about the severity of your illness?
	2	What did the doctor say about the severity of your illness?
	3	How much did your illness affect your career and family life?
	4	How is your health condition?
Social network interactions	5	Before your surgery, how much was your family aware of the severity of your illness?
	6	How much did your family and your relatives support you during illness?
	7	How much were your family and/or relatives involved in choosing your surgeon or hospital?
	8	How much was your cardiologist and/or family physician involved in choosing your surgeon or hospital?
	9	How much did your previous experience with the surgeon or hospital (by yourself or others), affect your choice?
	10	How much did the reputation of the hospital and/or surgeon, affect your choice?
	11	How much do you trust in your provincial medical care system?
Accessibility	12	How much did having access to a private hospital, affect your choice?
	13	How much did having access to specialized hospitals in neighboring provinces, affect your choice?
	14	How much did proximity to neighboring provinces, affect your choice?
	15	How much did the waiting time for surgery, affect your choice?
Appeal	16	How much did appropriate public view (public reputation) about the quality of hospital care, affect your choice?
	17	How much did hospital social acceptability (social class), affect your choice?
	18	How much did the attractiveness and suitability of the hospital environment, affect your choice?
Acceptability	19	How much did respect for your privacy by doctors and nurses, affect your choice?
Quality	20	How much did being aware of the quality of hospital services, affect your choice?
	21	How much did being aware of the skilled and experienced physicians and hospital staff, affect your choice?
	22	How much did being aware of hospital facilities and medical equipment, affect your choice?
Communication	23	How much did being aware of proper treatment and respect of doctors and nurses, affect your choice?
	24	How much did paying attention to the needs of patients by doctors and nurses, affect your choice?
	25	How much did information provided by your physician about the treatment including benefits/benefits, affect your choice?
Costs	26	How much did the cost of treatment affect your hospital choice?
	27	How much were other expenses including transportation and accommodation effective in making your decision?
Expected benefits	28	How much was your concern about the consequences of surgery/angiography and anesthesia or death, effective in your hospital choice?
	29	How much were concerns about the physical complications of surgery/angiography and subsequent disability, effective in your hospital choice?

Results

Of 142 participants t, 94 (66.2%) had coronary artery bypass graft surgery and 48 (8.33%) had other cardiac interventions. Of the 142 participants, 79 (55.5%) were male and 63 (44.4%) were female. The mean±SD age of the male participants was 58.9±11.55 and the mean age of women was 61.5±8.79. Also, 109 (76.8%) of participants, received services in the provincial hospital and 33 (23.3%) received the service in hospitals in other provinces.

Content validity

Considering CVR and CVI, as well as experts' opinions, out of thirty-five items, ten items were deleted and five items were accepted by modifications.

Mean CVR for remaining items was 0.72 and each factor ranged from 0.6 to 0.9. Finally, twenty-five remaining items along with four items related to the severity factor were selected in the initial questionnaire (Table 1).

Table 2. Remaining items and identified factors in exploratory factor analysis

	Item Number	Factor Loading	Item
Social network interactions	7	0.543	How much were your family and/or relatives involved in choosing your surgeon or hospital?
	9	0.710	How much did your previous experience with the surgeon or hospital (by yourself or others), affect your choice?
	10	0.759	How much did the reputation of the hospital and/or surgeon, affect your choice?
	21	0.616	How much did being aware of the skilled and experienced physicians and hospital staff, affect your choice?
Access	12	0.646	How much did having access to a private hospital, affect your choice?
	13	0.914	How much did having access to specialized hospitals in neighboring provinces, affect your choice?
	14	0.657	How much did proximity to neighboring provinces, affect your choice?
	17	0.456	How much did hospital social acceptability (social class), affect your choice?
	29	0.426	How much were concerns about the physical complications of surgery/angiography and subsequent disability, effective in your hospital choice?
Quality	16	0.600	How much did appropriate public view (public reputation) about the quality of hospital care, affect your choice?
	17	0.480	How much did hospital social acceptability (social class), affect your choice?
	18	0.641	How much did the attractiveness and suitability of the hospital environment, affect your choice?
	19	0.804	How much did respect for your privacy by doctors and nurses, affect your choice?
	20	0.692	How much did being aware of the quality of hospital services, affect your choice?
	22	0.724	How much did being aware of hospital facilities and medical equipment, affect your choice?
	23	0.692	How much did being aware of proper treatment and respect of doctors and nurses, affect your choice?
	24	0.684	How much did paying attention to the needs of patients by doctors and nurses, affect your choice?
	25	0.655	How much did information provided by your physician about the treatment including benefits/benefits, affect your choice?
	28	0.469	How much was your concern about the consequences of surgery/angiography and anesthesia or death, effective in your hospital choice?
	29	0.541	How much were concerns about the physical complications of surgery/angiography and subsequent disability, effective in your hospital choice?
Costs	26	0.900	How much did the cost of treatment affect your hospital choice?
	27	0.869	How much were other expenses including transportation and accommodation effective in making your decision?
	29	0.418	How much were concerns about the physical complications of surgery/angiography and subsequent disability, effective in your hospital choice?

Table 3. Fit indices for the four models investigated

Selected cut points	$\chi 2$	Normed chi-square ($\chi 2$/df) Less than 3	Root Mean Square Error of Approximation (RMSEA) Less than 0.06	Adjusted Goodness of Fit Index (AGFI) Above 0.9	Non-Normed Fit Index (NNFI) Above 0.95	Comparative Fit Index (CFI) Above 0.95	Expected Cross-Validation Index (ECVI) The least value is preferred
One Factor Model	704.8	4.15	0.149, 90%CI (0.14-0.16)	0.55	0.87	0.89	5.57
Uncorrelated Model	464.7	2.73	0.11, 90%CI (0.099-0.12)	0.67	0.93	0.94	3.86
Correlated Model	372.1	2.27	0.095, 90%CI (0.082-0.11)	0.7	0.95	0.96	3.29
Hierarchical Model	231.9	1.42	0.055, 90%CI (0.038-0.07)	0.7	0.98	0.99	2.31

Exploratory Factor Analysis

Factor analysis was performed with data gathered from 142 completed questionnaires. In total, 29 items related to 9 factors (including social network interactions, expected benefits, accessibility, appeal, acceptability, communication, quality, costs, and perceived severity of disease) were evaluated in this process. The Kaiser–Meyer–Olkin measure of sampling adequacy was equal to 0.856 and showed acceptable sampling adequacy for exploratory factor analysis (EFA). Bartlett's test of Sphericity was significant (P<0.001), which means rejecting the null hypothesis and justifying the factor analysis.

Finally, a four-factor pattern was found to be the most meaningful one accounting for 63.06% of outcome variable variation.

The factor structures are described as follows. The first factor, with four items, was named "interaction with social networks" and the factor loadings for constituting items was ranged from 0.543 to 0.759. The second factor was "Access" that factor loadings of its five items ranged from 0.426 to 0.914. The third factor, with 11 items, was titled "Quality" and its factor loadings ranged from 0.480 to 0.900. The last factor with only three items was "Costs" and factor loadings of its items ranged from 0.418 to 0.900 (Table 2).

In the case of items 17 and 29, there were cross-loadings; item 17 was loaded in two factors (quality and access), and item 29, was loaded in three factors (quality, access, and cost).

Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) was applied to confirm the model. A comparison of four presumptive models in terms of fit indices is summarized in Table 2. In the correlated model, better indicators were observed; NNFI and CFI reached the acceptable thresholds. However, the correlation between cost factor and social network interactions was not significant. In the hierarchical model, all four factors were related to a higher level variable (treatment-seeking behavior), and all relationships were significant; also, in the confirmatory factor analysis, no item was eliminated.

Guided by modification indices, investigators decided to add correlations between errors in several items within the quality factor that conceptually correlated. These error correlations were set between items 16 and 17 that were designed for appeal concept, items 23 and 24 which were chosen to express the concept of communication and also items 28 and 29 which were used to refer to a part of the concept of the expected benefit.

Finally, in the modified model, the chi-square statistic was 239.1 and the degree of freedom was 163; as a result, the $\chi 2$ / df index was 1.42. The NNFI index was 0.98, the CFI was 0.99, and the AGFI index reached 0.8 (Table 3). Both items with cross-loading were placed in the quality factor. In this factor, the factor loadings for items 17 and 29 were 0.77 and 0.8 respectively. The highest factor loading was in the case of the quality factor with a value of 1.1 and the lowest factor loading was 0.22 for the cost factor (Figure 1).

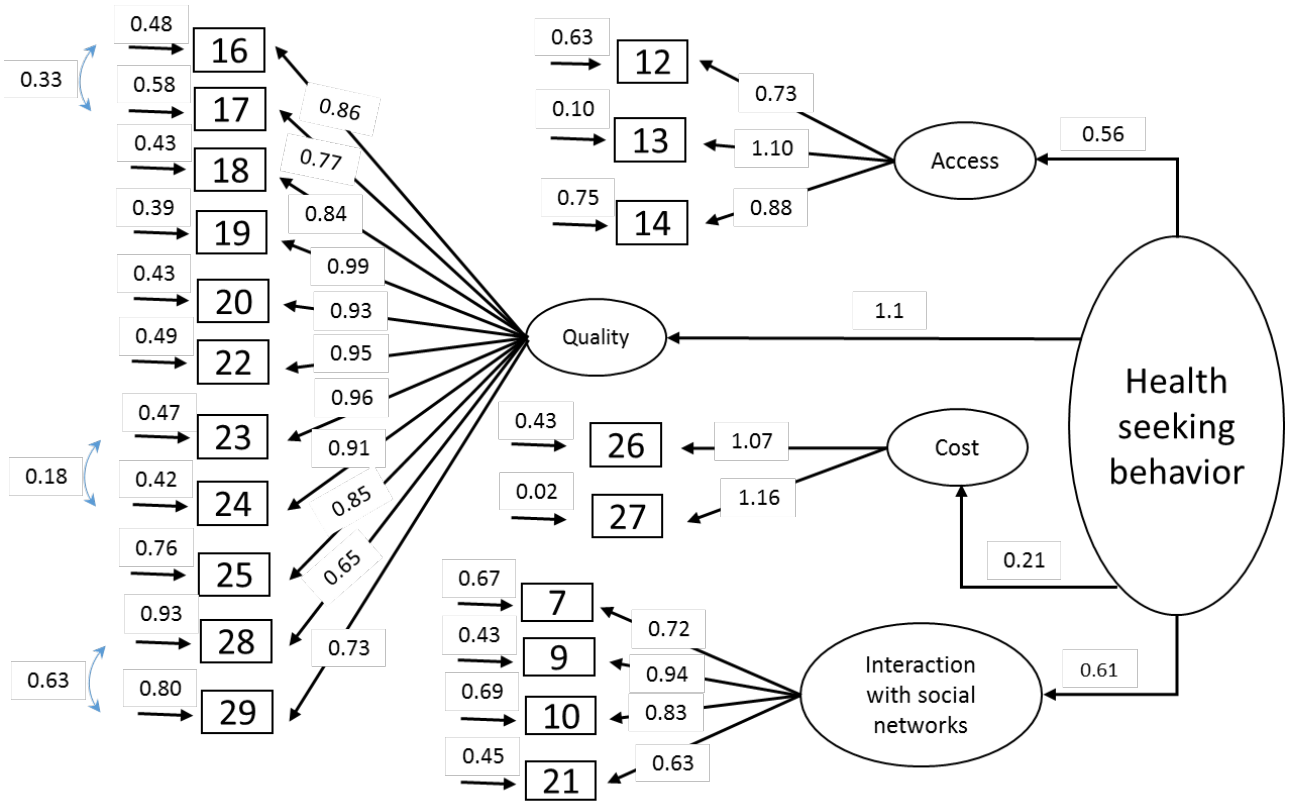

Figure 1. Hierarchical model factor loadings

Therefore, the instrument with four factors and three error covariance is considered to be a valid tool for measuring the treatment-seeking behavior.

Reliability

The calculated value of the Cronbach's alpha coefficient for all four constructs of the instrument was more than 0.8 and in the case of the quality and the cost factors were more than 0.9.

Discussion

This research tool was designed based on Kroeger's model, which divides the factors influencing health-seeking behavior into three categories including predisposing factors, characteristics, and perception of the disorder and characteristics of the service. (9).

The first part of the questionnaire consisted of 25 items referring to factors that did not require psychometric analysis. Items related to other effective factors on health-seeking behavior entered in the psychometric process are including social network interactions, cultural adaptation, expected benefits, accessibility, appeal, acceptability, communication, quality, and costs plus perceived severity of the disease. The effect of some factors mentioned in Kroeger's model such as the cultural adaptation was assumed to be constant due to low demographic variation in the population of this study. Also, none of the proposed items for the cultural adaptation was accepted by the expert group. Also, this concept was rarely used in studies (13). So it was decided not to consider these factors. Exploratory factor analysis reduced the number of factors to four factors, including interaction with social networks, access, quality, and costs.

During the exploratory factor analysis, all four items related to the severity factor were eliminated that may be considered due to the choice of a specific group of patients such as patients receiving a cardiac intervention in this study, which inevitably selected by specific clinical criteria (28).

The five factors of Kroeger's model including communication, acceptability, appeal, expected benefits, and quality, were put into one factor by the process of exploratory factor analysis; it seems that the items of these factors all reflect different aspects of the same concept we named service quality (4, 11, 29).

It may be argued that limiting specimens to a specific disease situation, such as what was done in this study, can lead to control of the effects of disorder-related factors. Thus, the Kroeger's model, by omitting the factors associated with the disorder, will comprise two categories of the individual-related and the service-related factors. Such a classification is similar to the classification used by Victoor et al. (individual characteristics and provider characteristics) (4), and also is similar to the classification of Jacobs et al. (demand-side and supply-side factors) (29).

In confirmatory factor analysis, the hierarchical model was confirmed by adding three error covariance in terms of model modification. It shows that summing the total of the entire scale is appropriate and represents a meaningful score (26). In this study, there was no need to remove any of the parameters, but three new paths were added based on the modification indices and the conceptual correlation of the items. Each pair of selected items were conceptually similar, and therefore adding correlations between errors was reasonably acceptable.

Since the Cronbach's alpha coefficient is a function of the number of items, and will necessarily increase by the increases of the number of items, it is recommended that Cronbach's alpha be calculated for each concept of the instrument separately (27). Cronbach's alpha was more than 0.8 for all four factors and both service quality and cost factors more than 0.9 which, given the acceptable alpha value of 0.7-0.95, provides evidence of the tool reliability (30).

In general, in this research, evidence indicated that the health-seeking behavior scale that designed based on Kroeger's model is a reliable and valid multidimensional scale for assessing effective factors in health-seeking behavior among patients requiring a cardiac intervention. We recommend that researchers evaluate this scale in different parts of Iran and different populations around the world.

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Conflict of interest

Authors declare no conflict of interests.

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