

Original Research



Development and Psychometric Properties Evaluation of a Care Needs Questionnaire in Phase 1 Cardiac Rehabilitation for Patients with Coronary Artery Disease: CNCR-Q

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Email: zarea_k@ajums.ac.ir**Abstract****Introduction:** Cardiovascular diseases (CVDs) are one of the most common chronic illnesses and the leading cause of mortality worldwide. This study aimed to design and assess the psychometric properties of questionnaire to examine the care needs of patients with coronary artery disease (CAD) in phase 1 of cardiac rehabilitation (CR).**Methods:** This sequential exploratory study used a mixed method with two phases. In the first phase, qualitative study was performed by analyzing the concept of Schwartz-Barcott-Kim hybrid model; and in the second phase, quantitative data were obtained and analyzed for the psychometric parameters of the designed tool.**Results:** The questionnaire for care needs was based on the indicators of measurement, which was identified in the qualitative phase of the study, as a tool with 40 items. After conducting face validity qualitatively, all tool items were considered important and were retained for the next steps. After completing the steps for determining the content validity ratio (CVR) and content validity index (CVI) of 40 items, they were preserved for decision making at a later stage. The results of exploratory factor analysis revealed four factors; the factor analysis of three items was eliminated and the final version of the questionnaire CNCR-Q (Care Needs Cardiac Rehabilitation-Questionnaire) with 37 items remained.**Conclusion:** The findings indicated that the questionnaire with properties, such as simple scoring, reliability and validity, is an appropriate tool for assessing care needs in Iranian patients with CAD. Moreover, the CNCR-Q is an effective instrument for assessing patient needs before discharge.**Introduction**

Cardiovascular diseases (CVDs) are one of the most common chronic illnesses and the leading cause of mortality worldwide.¹ In the past years, about 15 million persons in Iran were affected by CVDs, while a large part of the general population is at risk of developing cardiovascular in the next years.² Therefore, the application of the principles of prevention in these diseases can be very effective. Cardiac rehabilitation (CR) provides a cost-effective therapy that aims to accelerate recovery following an acute event and reduce the risk of recurrent events through organized exercise prescription, education and risk factor adjustment.³ Referral to CR is a recommendation for all patients with coronary artery disease (CAD).⁴⁻⁷ Based on a rising body of evidence, participation can reduce hospital bed usage, cardiovascular death, as well as increase functional capacity and quality of

life.⁴ In particular, the role of nurses' educational support has been outlined by Orem to explain their role in the rehabilitation process in cardiac special wards. Therefore, nurse's focus in this section is to rehabilitate patients with diseases which indicates CR, to accurately identify social, emotional and physical needs of patients and give them appropriate training to prepare them for roles that they played in the past. Evidence suggests that provision of these programs is out of nurses' due to the limited time they have. Therefore, having accurate assessment tools in a clinical setting to assess the needs of patients and their family can compensate for nurses' time constraints and increase effectiveness of the rehabilitation program.⁸ Few studies have been done to accurately determine the needs of these patients and since the design of the tool is the first step in defining the concept and defining the concepts of a great deal of dependence on the philosophy

and culture of societies that these definitions take place in their domain.⁹⁻¹² So, it seems necessary the design of a tool that is appropriate for the culture of Iran, with acceptable validity and reliability and also in accordance with the condition of the patients. Therefore, this study aimed to develop and evaluate psychometric properties of care needs questionnaire in phase 1 of CR in patients with CAD.

Materials and Methods

This study was a research project approved by Ahvaz University of Medical Sciences with CDCRC-9412 code and derived from a Ph.D. Nursing dissertation titled "Development and psychometric properties Evaluation of a care needs Questionnaire in phase 1 Cardiac Rehabilitation for patients with Coronary Artery Disease," with thesis registration number: 115. This is a mixed method (sequential exploratory) study, one of the most popular and appropriate method for developing tools. That involved two phases: (1) Explaining the meaning of care needs and (2) Psychometric of the questionnaire through quantitative study.

Phase one

In the first stage of the research, concept analysis study was performed using of Schwartz-Barcott-Kim hybrid model for analyzing the concept of care needs in Phase 1 of CR in patients with CAD in the Islamic Society of Iran. An analysis of the concept of the hybrid model by Schwartz-Barcott and Kim is in three steps: 1. Theoretical

review; 2. Work in field (field research) and 3. Analysis.¹³ Therefore, in the current study, in theoretical review step, all available valid electronic databases such as Scopus, CINHALL, Medline, PubMed, Elsevier and Web of Science with the keywords: coronary heart disease AND cardiac rehabilitation, coronary heart disease AND care need, self-care need OR post discharge education OR information need OR learning need OR patient teaching in the title and abstract of the articles were searched. A massive search was done without time limit, until September 2016 at the sites. A total of article was found (2378), after reviewing them, 47 related to the concept and 4 textbooks were reviewed. Articles were limited to Persian and English (Figure 1). In the field work step, considering the nature of the concept of care needs and obtaining a comprehensive view of the concept, participants were chosen from patients with acute coronary syndrome (ACS), myocardial infarction and post open heart surgery (given the equal need of care for these patients), and doctors and nurses who were involved in care of patients.

Interviews were conducted with 6 patients, 5 nurses and 1 physician (cardiologist) that were saturated after 4 initial interviews with patients and 3 nurses' interviews, but to ensure, 2 other interviews with patients and 2 interviews with nurses done. Semi-structured interview with the participants was done after obtaining informed consent from the participants and ensuring confidentiality of the data. An interview guide was developed based on the results of the theoretical phase. The guide included several broad questions, including "Would you please

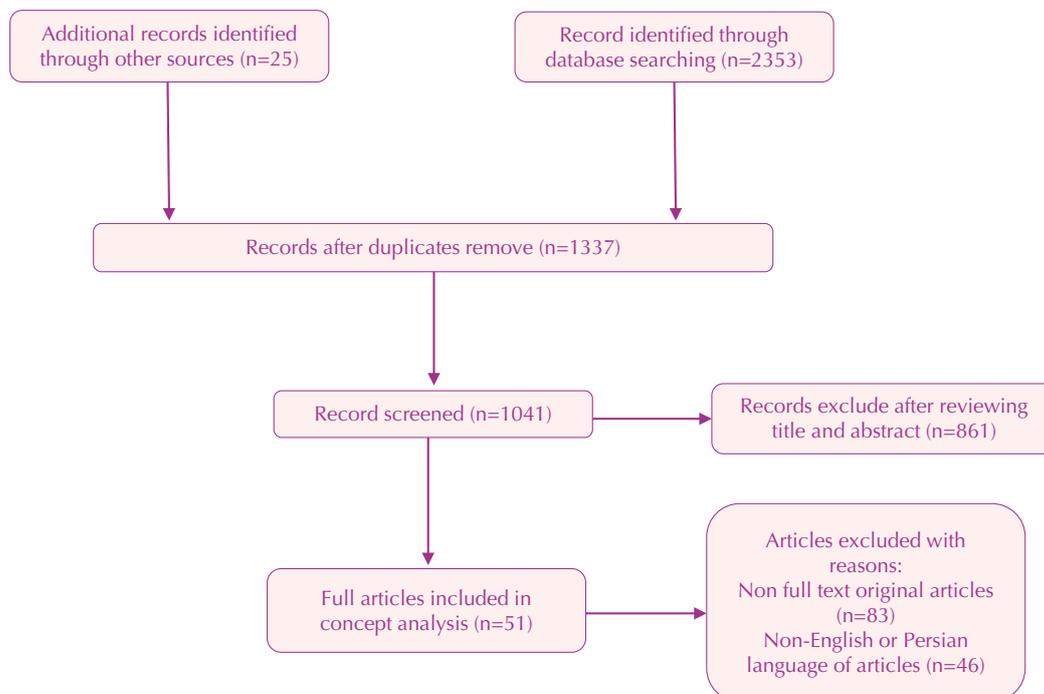


Figure 1. Flow chart of the study (theoretical review step)

describe what kind of information you have received since you developed this disease?” “Would you explain the impact of the disease on your sexual activities? Would you explain how much physical activity you can do?” “Do you know when you can do physical activity?” Also, probing questions were formulated and used during interviews. An analysis of the interviews was conducted using directed content analysis by a non-constructed matrix. The interviews were carefully listened to several times and the text of the manuscripts was reviewed several times in order to gain a profound and correct understanding and break it into smallest units (codes). The codes were divided into four categories (physical care needs, psychological care needs, social care needs and spiritual care needs). In order to credibility, the method of continuous engagement with data and confirmation of findings by contributors (extracting codes and re-confirming by contributors in case of ambiguity in extraction codes) and review by supervisor (reviewing the process of analysis and extraction of data) was used. The codes were used by two colleagues.¹⁴ Then, in the final analysis step, the findings of the theoretical review and field work (prior two steps) were merged to obtain the final definition in relation to the concept. In the present study, for designed questionnaire the approach of Waltz et al., was used.¹⁵

Phase two

In the second phase of the research, quantitative data were obtained and analyzed for the psychometric of the designed tool. Face validity was evaluated qualitatively and quantitatively. To perform face validity (qualitatively), the basic tools for care needs were prepared in the form of four Likert with terms: 1= the phrase is complex to 4= the phrase is very simple and fluent. Regarding the relevance or specificity of the care needs questionnaire, the four Likert scale was used which includes: 1= the phrase is irrelevant to 4= The phrase is quite relevant. Regarding transparency and clarity, the four Likert scale was used which includes: 1= the phrase is inaccurate to 4= The phrase is completely transparent and understandable. In order to carry out face validity (quantitatively), the coefficient of effect of items was calculated. The instrument was provided to 12 patients admitted to the study centers. The coefficient of effect of items was calculated according to the formula. The coefficients of the item's impact were higher than 1.5 and were selected as suitable items and maintained for later stages. To determine the content validity of the questionnaire, two qualitative and quantitative methods were used. To determine the content validity and clarity of the items (qualitatively), 10 medical experts in nursing and medical sciences were asked to examine each item and while studying each item, comments and views were corrected in an exhaustive manner. Content validity (quantitatively) was performed by using the Content Validity Index (CVI) and Content Validity Ratio (CVR). Calculation of the CVR for each item was performed using

the CVR formula and experts' panel. Then, by referring to the Lawshe table, if the number calculated with the formula for each item is (0.6) or larger, those items were considered essential and maintained for later analysis.¹⁶ (In fact, this indicates that the presence of relevant items with an acceptable statistical significance level ($P < 0.05$) is essential for this tool). Also, three criteria: simplicity and fluidity, relevancy, clarity and transparency used for each item based on the CVI formula. The acceptance of each item was based on the following criteria: the content of the CVI above 0.79 is appropriate, the CVI score is between 0.79 and 0.70 which needs to be corrected and revised, and the CVI score of less than 0.70 is considered unacceptable, and items were removed from the list.¹⁷

Construct validity performed by exploratory factor analysis and a rotating correlation matrix was used to group the variables that have internal correlation. The sample size ($N = 200$) at the quantitative stage of the present study was 5 times the number of items. Data were analyzed by SPSS software version 13. Also, before performing the analysis of the main components, adequacy of the data for exploratory factor analysis was evaluated based on the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity and data extracted with component principle method. Also, rotation method was Varimax with Kaiser normalization test and the items were found to be higher than 0.3 were used for factor analysis. In this study, Cronbach's alpha coefficient was used to determine the reliability of the instrument. Cronbach's alpha was calculated for all the structures and also, using the internal consistency method, the values above 0.7 were considered appropriate.

Results

The findings of the concept analysis showed: “Care needs of patients with CAD (patients with myocardial infarction and ACS and patients after coronary artery bypass grafting) in phase 1 of CR; Knowledge, considerations, expectations and skills in the field. Educational care needs are related to physical, psychological, social and spiritual care needs” (Table 1). The questionnaire for care needs was based on the indicators of measurement, which was identified in the qualitative phase of the study, as a tool with 40 items. This includes the physical care needs with 22 items, the psychological care needs with 6 items, the social care needs with 4 items and the spiritual care needs with 8 items. After carrying out qualitatively face validity, all tool items were considered important and were retained for the next steps. Therefore, at the end of the qualitative and quantitative face validity, the 40 items mentioned above were obtained without changing the number of items for content validity. After completing the steps for determining the CVR and the CVI of 40 items, they were preserved for decision making at a later stage. Scoring items (scaling) was prepared due to the different nature of the care needs including: 4 options and the five

Table 1. Compare the findings of the theoretical and field work phase

Theoretical findings	Field work findings	Hybrid sub components
Physical needs	Physical needs	Education about the disease, the rate and mode of sexual activity, the rate of physical activity, control of risk factors, appropriate diet, medicinal diet, appropriate exercise, self-monitoring during physical activity, stop smoking, follow-up visits, wound care education, education important reportable signs and symptoms
Psychological needs	Psychological needs	Education to control stress and anxiety, prevention of depression
Social needs	Social needs	How to meet friend and family, returning to the work and matching with the job
	Spiritual needs	Relaxation from spirituality, tools for spiritual needs, inadequate education on the impact of spirituality

Likert scale, (a) Always (4); (b) Most of the time (3); (c) sometimes (2); (d) Rarely (1); (e) Never (0). In multiple choice questions if patient answer was true, the score was 1 and if the patient answer was wrong, the score was 0.

The results showed that since the KMO value is 0.76, the number of subjects studied is sufficient for factor analysis. The Bartlett test of sphericity also expresses the accuracy of the model of the factor analysis ($P = 0.000$). The correlation coefficient matrix was calculated and variables that correlated with other variables were analyzed in the first stage of factor analysis. Commonly, the items were found to be higher than 0.3 were used for factor analysis (Table 2). Commonalties percentage question of Care Need questionnaire was shown in Table 3. Also the final name of four factors that extracted after factor analysis, variance percentage and cumulative percentage reported in Table 4. Three items were eliminated in factor analysis step, and the final version of the questionnaire with 37 items and 4 factors remained (Figure 2).

The questionnaire of care needs in patients with coronary heart disease has an internal consistency of 0.782 (Table 5).

Final Care Needs Questionnaire in Phase 1 of CR in Patients with CAD (CNCR-Q), was shown in Online Supplementary file 1.

Discussion

Patients admitted into intensive care wards, due to specific conditions of their disease and the specific environment of the intensive care ward, are subject to stressors and many upset factors. On the other hand, due to their weakness, disability, sedation and their short stay in this ward, they are not able to express their needs.¹⁸ Therefore, the questionnaire for assessing care needs was designed to provide assistance to nurses working in these wards to better identify the care needs of these patients in phase 1 (before discharge) CR and ultimately increase the quality of care for them. This research is a novelty due to the design and psychometric of the care needs questionnaire based on religious culture in Iran.

Components of this questionnaire consisted of 37 items in 4 dimensions including physical care needs (16 questions), social-family care needs (8 questions), spiritual-psychological care needs (9 questions) and requirements for the discharge plan (4 questions). For scoring the questionnaire, in physical care needs minimum

score is 0 and maximum score is 16. In requirements for the discharge plan minimum score is 0 and maximum score is 4. In Spiritual-psychological care needs minimum score is 0 and maximum score is 36 and in Social-family care needs minimum score is 0 and maximum score is 21. A higher score indicates the lower patient need for education.

In the study of Ghisi et al., 11 factors were identified as the information needs of CR patients: the heart (physiology, symptoms, surgical treatment), nutrition, exercise and physical activity, drugs, work/occupation, social activity, stress/psychological factors, social/general concerns, emergency/safety, diagnosis and treatment, risk factors, goals and barriers.¹⁹

In another study by Gerard and Peterson, eight factors were identified as the learning needs of patients with myocardial infarction: the introduction of intensive care unit, anatomy and physiology, psychosocial factors, risk factors, drug information, nutritional information, physical activity and other relevant information.²⁰ In another study by Phelan et al., thirteen factors were identified as the learning needs of heart patients, which include: understanding health, nutrition, excretion, activity/exercise, perception, sleep and rest of the patient, self-understanding, role/communication, sex, stress/compatibility, values/beliefs, clearance program and educational needs.²¹ The current study is superior as compared to the studies mentioned because care needs

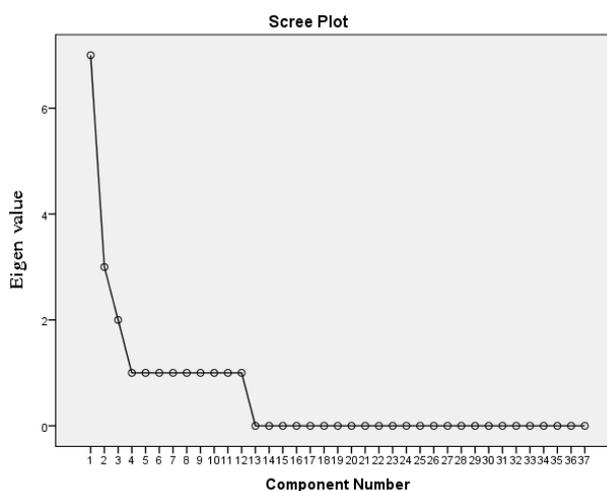


Figure 2. Scree plot to determine the graphical representation of the factors.

Table 2. Rotational matrix of extracted components based on factor load

Questions	Factors				Questions	Factors			
	1	2	3	4		1	2	3	4
Q1		0.291			Q20		0.211		
Q2		0.427			Q21			0.308	
Q3		0.504			Q22				
Q4		0.403	0.502		Q23	0.513	0.317		
Q5			0.543		Q24	0.328	0.500		
Q6			0.399		Q25	0.253	0.216		
Q7			.0390	0.525	Q26			0.720	
Q8					Q27				0.265
Q9					Q28			0.774	
Q10		0.171		0.353	Q29			0.631	
Q11		0.524			Q30			0.686	0.223
Q12		0.404			Q31	0.349			
Q13				0.541	Q32	0.173	0.511		
Q14					Q33	0.457			
Q15		0.366			Q34	0.401			
Q16		0.052			Q35	0.517			
Q17		0.376		0.399	Q36	0.343			
Q18		0.260		0.525	Q37				0.471
Q19		0.269			Q20				

Table 3. Communalities questionnaire Care Need

Questions	Communalities	Questions	Communalities	Questions	Communalities	Questions	Communalities
1	0.291	11	0.404	21		31	0.500
2	0.427	12	0.366	22		32	0.216
3	0.504	13	0.052	23	0.349	33	0.511
4	0.403	14	0.376	24	0.173	34	0.806
5	0.502	15	0.260	25	0.457	35	0.720
6	0.543	16	0.269	26	0.401	36	0.774
7	0.399	17	0.303	27	0.517	37	0.631
8	0.390	18	0.513	28	0.343		
9	0.171	19	0.328	29	0.211		
10	0.524	20	0.253	30	0.317		

Table 4. Total variance of 4 factors in Care Needs Cardiac Rehabilitation Questionnaire

Factors	Total	% Of Variance	Cumulative %
Spiritual-psychological care needs	4.985	13.117	13.117
Physical care needs	4.904	12.906	26.023
Social-family care needs	3.182	8.373	34.379
Requirements for the discharge plan	2.307	6.070	40.467

Table 5. Number of questions and internal consistency of Cronbach's alpha for each factor and the entire questionnaire

Factor name	Number of questions	Cronbach's alpha
Physical care needs	16	0.85
Spiritual-psychological care needs	9	0.83
Social-family care needs	8	0.73
Requirement of the discharge plan	4	0.39
Total	37	0.78

in this research are based on patients' interview and understanding their actual needs, while in the studies mentioned, patients' information and educational needs are limited to literature review. It has been found that in

some cases, these needs may not be appropriate for the patient's actual need. In another study by Ghisi et al., four factors were identified as the educational needs of patients undergoing CR: CAD, drug diagnosis and treatment,

risk factors and lifestyle and related sports.²² Compared with Ghisi et al., who have mainly dealt with training on physical needs, our study is more comprehensive and conclusive in that it is also concerned with other patients' care needs such as the spiritual, social and psychological needs were investigated.

The content validity of the questionnaire was evaluated based on expert judgment. Verification of the content of the questionnaire by experts is one of the best ways to obtain evidence in support of a tool.²³ While there are three tools available in this field, their content was not reported, which has led to their use with caution.^{20,21,24} In the initial design of the questionnaire, the four dimensions: physical, psychological, social and spiritual care needs were classified. The results of the factor analysis showed that the psychological dimension is consistent with the spiritual meaning. Therefore, the terms of these two domains were called "spiritual care needs". Phrases related to the physical care needs were also similar factor load after the factor analysis, and they were placed under the category of "physical care needs". The next field phrases were a combination of questions on physical, psychological and social dimensions, and given the fact that the most frequent factor was sexual questions, this dimension was called the dimension of "social care needs", and in relation to the final dimension, given that the questions in this dimension were a combination of questions relating to the physical, social and spiritual dimension, they were called the "requirements of the discharge plan". Therefore, due to the consistency of the expressions in the factors resulting from factor analysis with the definition and dimensions of the concept of care needs in phase 1 of the rehabilitation of patients with CAD, the validity of the tool construct was confirmed by factor analysis. Ghisi et al., also used factor analysis to determine the validity of the educational tool construct for coronary heart disease patients under CR. However, due to different definitions of the concept of care needs in this research, the number and naming of factors were different.²² In another study by Ghisi et al., on the design of educational needs of patients undergoing CR, only the criterion validity to validate their tools were used, and the authors pointed out that the construct validity of the instrument and its sensitivity were not investigated in different situation, thus, this is the limitation to the use of this tool.¹⁹ In two other tools designed by Phelan et al., and Gerard & Peterson, for the needs of heart patients, the construct validity of the tool was not investigated, which is one of the limitations of the above tools.^{20,21} Reliability in the tool is one of the most important criteria that shows the quality of the tool (burns). The questionnaire of care needs in patients with coronary heart disease has an internal consistency of 0.782 (Table 5).

Ghisi et al., also used the internal consistency method to determine the reliability of their tools. However, the author used the test retest method to determine the stability of the tools, but in the current study, due to the

nature of the concept of care needs, this method was not used for determination of stability.^{19,22} Also, tools designed by Phelan et al., and Gerard & Peterson, on the needs of heart patients also did not show the content validity of the tool.^{20,21} One of the differences between the present questionnaire and some of the tools that have been introduced so far is its reliance on acceptable values and beliefs in Iranian society. One of the main features of this difference is the need for spiritual care as one of the components of the caring needs of heart patients. Examples such as "nurses provide conditions for prayer for patients", "Nurses refer patients to religious clerics, "or other similar items, show that Iranian heart patients seek some of their care needs in connection with divine sources and seek help from God through worship practices in order to meet their spiritual needs.

Despite the fact that the most important strengths of this study were the use of a hybrid model for analyzing the concept of care needs, both theoretical review and work done in the field also has limitations. One of the limitations of this study was that the participants were selected from hospitals affiliated to medical universities and private hospitals in Ahvaz. Although, the Ahvaz is known as a treasure of cultures due to its diverse cultures, considering that there are different cultures in Iran, the results of this study may not be generalized to all patients throughout Iran. On the other hand, due to executive constraints, the samples of this study for measuring psychometric properties were selected by convenience sampling. Other limitations of this study are that the detected factors in the psychometric step of the tool include about 40% of the total variance. It seems that there are other factors that play a role in measurement of the care needs and this study was not able to identify them. Also, another limitation of this study is failure to implement criterion validity, because none of available tools were performed in phase 1 CR and all available instruments have assessed patients' needs while they have completed CR. CR include three phase²⁵ and the patients needs are different in different phase.²⁶ Although this study seems to be the first attempt by the nursing community to develop the concept of care needs and build its measurement tools based on Islamic teachings in Iran, it will not naturally be the last attempt, thus further studies should be done. Therefore, it is suggested that the psychometric properties of this tool should be measured based on different cultures and different points of Iran based on random sampling.

Conclusion

Based on the results of this study, the care needs questionnaire for patients with CAD in phase 1 of CR were designed based on the concept of the care needs in Iranian culture. Because this tool was designed based on understanding of the concept of care needs from the viewpoint of patients with CAD and examining their experiences through qualitative research, reliability and

Research Highlights

What is the current knowledge?

- Other questionnaire designed according literature review and only one questionnaire designed according actual patients need.
- Attribute of care needs in other questionnaire including physical, social and psychological care needs.

What is new here?

- The hybrid model was used for designing questionnaire.
- Designing the questionnaire according actual patients need and viewpoint of patients was done.
- Novelty in finding, the attribute of spiritual care needs did not mention in the literature.
- This is the first attempt to develop measurement tools based on Islamic teachings.

validity, simplicity and fluidity, and ability to complete within 10-15 min to examine care needs of heart patients is suitable. Therefore, considering the lack of valid and reliable tools in accordance with Iran's cultural conditions to assess the care needs of patients with CAD, this study will be helpful in achieving the above goal.

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Ethical Issues

This study was confirmed by ethical committee of Ahvaz Jundishapur University of Medical Sciences (AJUMS) with code: IR.AJUMS.REC.1394.722.

Conflict of Interest

The authors declare no conflict of interest in this work.

Author's Contributions

All authors contributed to the conception and design, acquisition of data, analysis and interpretation of data, drafting the article, review of article and find approval.

Supplementary Materials

Supplementary file 1. Final Care Needs Questionnaire in Phase 1 of CR in Patients with CAD: CNCR-Q.

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