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ORIGINAL RESEARCH

Construction of a Risk Factor Intervention Program for Perimenopausal Patients with Coronary Heart Disease Based on Health Action Process Orientation Theory

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Background: To construct a risk factor intervention program for perimenopausal patients with coronary heart disease based on the health action process orientation theory, to provide a reference for perimenopausal women to reduce the controllable risk factors of coronary heart disease.

Methods: By reviewing relevant literature, guidelines, and expert consensus, we performed a retrospective analysis of the factors influencing perimenopausal patients with coronary heart disease to engage in risk factor reduction behaviors in the preliminary stage, conducted qualitative interviews on patients' cognition of and motivation for adherence to cardiac rehabilitation, and initially formulated an intervention program for perimenopausal patients with coronary heart disease regarding their risk factors based on the theoretical model of the process of action orientation to health and formed Expert Correspondence Form.

Results: The positive response rate of experts in the 2 rounds of correspondence was 100%, the basis of expert judgment (Ca) was 0.955, the familiarity (Cs) was 0.964, the authority coefficient (Cr) was 0.960, and the Kendall's W coefficients were 0.294 and 0.343, respectively ($P<0.05$). The final result was a risk factor intervention program for perimenopausal patients consisting of coronary heart disease based on the health action process orientation theory with 3 level 1, 10 level 2, and 42 level 3 entries.

Conclusion: Based on the health action process orientation theory of perimenopausal patients with coronary heart disease risk factor intervention program scientific construction process, the construction of the content around the perimenopausal patients with coronary heart disease characteristics, the development of targeted interventions.

Keywords: perimenopause, coronary heart disease, health action process orientation theory, cardiac rehabilitation

Introduction

Perimenopause refers to the phase of life before and after menopause in women, owing to the gradual decline of ovarian function, there is a decrease in the amount of menstrual flow, shortening of the menstrual period, amenorrhea, and other phenomena.[1] The American Heart Association (AHA) survey suggests that cardiovascular disease is the main cause of death in women,[2,3] and the "Chinese Women's Cardiovascular Disease Prevention Expert Consensus"[4] indicates that menopause is a distinctive and independent risk factor for coronary heart disease in women. Specifically, perimenopause has a high incidence of coronary heart disease in women. Hence, it is important to reduce the risk of coronary heart disease in patients with perimenopausal disease. Perimenopause has a high incidence of coronary heart disease in women. Thus, it is particularly crucial to reduce the risk factors of perimenopausal patients with coronary heart disease and reduce the occurrence of malignant events.

Numerous domestic studies[5–7] have shown that patient body mass index, hypertension, diabetes mellitus, smoking, family history of CHD, depression, mean platelet volume, low-density lipoprotein, and follicle-stimulating hormone are

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risk factors affecting perimenopausal women with combined CHD. Among them, family history of CHD and history of stroke are uncontrollable factors, follicle-stimulating hormone, luteinizing hormone, and estradiol are not recommended for replacement therapy at present,[8] mean platelet volume and platelet distribution width interventions can be achieved by adjusting lipids, blood glucose, and blood pressure, and body mass index, hypertension, diabetes mellitus, smoking, and bad mood are also the focus of this inquiry topic. Scarce literature exists at home and abroad that mentions specific intervention countermeasures for risk factors in perimenopausal patients with coronary artery disease, and guidelines and expert consensus advocate strengthening lifestyle changes[4,9] to reduce risk factors in this special population.

Cardiac rehabilitation refers to the application of five major prescriptions: medication, exercise, nutrition, psychosocial and behavioral interventions, and smoking and alcohol cessation[10] so that patients with cardiovascular disease can attain a normal or near-normal living state, reduce the risk of recurrent cardiovascular events and sudden death, and restore physical vigor and reenter society as soon as possible.

Health Action Process Approach (HAPA)[11] proposes that the adoption, initiation, and maintenance of health behaviors constitutes a staged process of change, sequentially in the pre-intentional stage, the intentional stage, and the action stage, while emphasizing the mediating role of behavioral plans in the transformation of behavioral intentions to behaviors, and argues that behavioral control is an important psychosocial factor influencing the maintenance of health behaviors.

The theory has been utilized in self-management behavioral studies of patients with diabetes[12] and asthma,[13] and both have attained good results, but it has not been identified as used for coronary heart disease risk factor intervention. In the present study, under the guidance of the theory of health action process orientation and based on the five prescriptions of cardiac rehabilitation, we constructed an intervention program for risk factors of perimenopausal patients with coronary heart disease, to provide a reference for patients with coronary heart disease in this special period to actively participate in the management of the disease.

Materials and Methods

General Information

Eleven experts from fields including cardiology, rehabilitation, geriatrics, gynecology, psychology, nutrition, and nursing management were selected for two rounds of Delphi expert consultation in June-July 2023 using purposive sampling. Expert inclusion criteria: ① more than 10 years of work in cardiology, rehabilitation, geriatrics, gynecology, psychology, nutrition, and nursing management; ② bachelor's degree or above; ③ intermediate title or higher title; ④ abundant experience related to coronary heart disease care; ⑤ sufficient time to participate in the consultation and voluntary participation in this study. Experts' years of experience: 7 (63.64%) ranging from 10 to 19 years, 2 (18.18%) from 20 to 29 years, 2 (18.18%) ≥30 years; source: 6 (54.55%) from Zhejiang Province, 2 (18.18%) from Guangdong Province, 1 (9.09%) from each of Sichuan, Jilin, and Guangxi Provinces; title: 2 (18.18%) of full senior level, 6 of associate senior level (54.55%), 3 intermediate (27.27%); specialty: 5 clinical nursing specialists (45.45%), 4 clinical medical specialists (36.36%), 2 clinical rehabilitation specialists (18.18%); education: 2 master's degree (18.18%), 9 bachelor's degree (81.82%). This study was approved by the Hospital Ethics Committee of Jiaxing No. 2 Hospital (Approval Number JXEY2024-092-01). The two project leaders communicated with each expert and patient about the details of the implementation of the study, and the experts and patients signed an informed consent form after clarifying the entire process and agreeing to participate in the study. For data in the course of the study, we prevent leakage by keeping the data of experts and patients in a fixed stand-alone computer and replacing the units involving human names with serial numbers. Participating patients have stable and regular access to specialists in their field.

Methods

Methodologically, we will elucidate the process of the study in terms of research team establishment, research framework, literature survey, qualitative interviews, Delphi Expert Consultation Method, data collection strategy and statistical methods.

Establishment of the Research Team

The members of this research team comprised one cardiovascular critical care clinical nursing specialist, two cardiac rehabilitation specialist nurses, one cardiology medical specialist, one rehabilitation therapist, and two research specialists, of which three had senior titles, three had intermediate titles, one had junior titles, and two members had postgraduate degrees. The members of the research team were accountable for the construction of the risk factor intervention program, the establishment of an expert correspondence form, the discussion, analysis, and modification of the program according to the experts' opinions, and the determination of the final risk factor intervention program for perimenopausal patients with coronary heart disease based on the theory of health action process orientation.

Research Framework

The core of health action process orientation theory encompasses the following elements. ① Pre-intentional stage: Individuals recognize the peril of a certain behavior, weigh the pros and cons of adopting healthy behaviors, and evaluate their ability to take action successfully to form behavioral intentions; ② Intentional stage: To achieve behavioral intentions, individuals need to determine the action goals and formulate action plans. ③ Action stage: To overcome the difficulties encountered during the action process, self-monitoring strategies and self-regulation strategies are utilized to adhere to the action and ultimately develop healthy behaviors. In this study, a risk factor intervention program for perimenopausal patients with coronary heart disease was constructed based on this theory, and the core content was adopted as the first-level entry.

Literature Search

Two researchers searched the China Knowledge Network, Wanfang, PubMed, Web of Science, and other websites for "perimenopause/perimenopausal period/coronary atherosclerotic heart disease/coronary heart disease" in Chinese, "menopause/perimenopausal period/coronary atherosclerotic heart disease" in English, using a combination of subject words and free words, respectively. With "menopause / perimenopausal period /coronary atherosclerotic heart disease /coronary heart disease" as the search term in English, we used a combination of subject terms and free terms to search Chinese and foreign databases, such as China Knowledge, Wanfang, PubMed, Web of Science, etc, for publicly available information on perimenopausal coronary heart disease published from the establishment of the database to 2023, as well as published literature related to perimenopausal coronary heart disease. Based on the requirements for intervention for perimenopausal patients with coronary heart disease according to the health action process orientation theory and the results of the literature, and in conjunction with the Expert Consensus on the Prevention of Cardiovascular Disease in Chinese Women[4] and the American Heart Association Guidelines for the Prevention of Heart Disease in Women,[2] we held a meeting of the research group to determine the preliminary framework of the risk factor intervention program for perimenopausal patients with coronary heart disease based on the health action process orientation theory.

Qualitative Interviews

Semi-structured interviews were carried out to acquire an in-depth comprehension of the main health problems and expected goals of perimenopausal patients with coronary heart disease (CHD) during previous nursing interventions and to supplement and revise the content of the first draft of the risk factor intervention program for perimenopausal patients with CHD based on the theory of Health Action Process Orientation. Using a purposive sampling approach, 12 cases of perimenopausal coronary heart disease patients in a tertiary hospital in Zhejiang Province in May-June 2023 were chosen for semi-structured interviews. Inclusion criteria: ① patients who were in perimenopause;[14] ② those who met the diagnostic criteria for coronary artery disease;[15] ③ those who had no language or communication barriers and were conscious; ④ those who could use smartphones. Exclusion criteria: ① those with unprocessed serious coronary artery lesions; ② those with menstrual disorders or menopause due to long-term menstrual disorders, medications, surgery, diseases, or transient psychiatric factors; ③ those who use estrogen replacement therapy; ④ those with a history of previous psychiatric disorders; ⑤ those who are currently suffering from tumors or systemic malignant diseases; ⑥ those

who have developed dysfunctions in the patient's organs such as liver and kidneys; ⑦ those who are impaired in limb movement.

Delphi Expert Consultation Method

Based on literature research, qualitative interviews, and group discussions, we designed an expert questionnaire on "Perimenopausal Coronary Heart Disease Patients' Risk Factor Intervention Program Based on Health Action Process Orientation Theory". The main content includes four parts, as follows: ① Guideline: it encompasses information about the main content of the study, the purpose of the study, the requirements for completing the questionnaire, the key points of the questionnaire, how and when the questionnaire is to be returned, and acknowledgments. ② The body of the questionnaire: includes the 3 stages of Health Action Process Orientation Theory as level 1 entries (pre-intention stage, intention stage, and action stage, respectively), 10 steps as level 2 entries, and 42 sub-themes as level 3 entries. The first round of the questionnaire was designed to ask experts to rate the necessity of each component of the risk factor intervention program for perimenopausal patients with coronary heart disease based on the health action process orientation theory on a 5-point Likert scale (each entry was categorized by the level of importance as "very important" = 5 points, "more important" = 5 points, "more important" = 5 points, "more important" = 5 points, "more important" = 5 points, "more important" = 5 points, and "more important" = 5 points, "More important" = 4 points, "Generally important" = 3 points, "Not important" = 2 points, and "Very unimportant" = 1 point), if experts believe that the entry is unclear, the expression is not specific or belongs to different dimensions, experts can write in the "modification of the opinion" column to modify the opinion, if the experts believe that there is a need to increase the entry, can be written in the supplementary column of the proposal or opinion. ③ Basic information of the expert. ④ The expert's familiarity and the basis for judgment.

Methods of Data Collection

The questionnaire was disseminated to the experts by e-mail WeChat or pinning, and the experts were contacted 2 weeks later to enquire about the progress of filling out the questionnaire. The experts could respond to the e-mail, WeChat, or pinning in the same manner as they had completed the questionnaire, and those who failed to complete the questionnaire punctually were reminded of the questionnaire by the researcher through SMS, WeChat, pinning, or e-mail. After the first round of experts' questionnaires is recovered, members of the research team will discuss the experts' opinions, revise the questionnaires following consultation, and form the second round of experts' questionnaires, with the summary of the expert's opinions in the first round and the corresponding adopted and unadopted opinions, and then contact the experts in the same manner and distribute the questionnaires, and the interval between the two rounds of experts' questionnaires will be more than 2 weeks.

Statistical Methods

Excel and SPSS 25.0 statistical software were applied to analyze the data of the two rounds of expert correspondence, and the counting information was represented by frequency, percentage, or composition ratio (%). The positive coefficient of experts was expressed by the effective recovery rate (%) of the questionnaire, the degree of authority of experts was expressed by the coefficient of authority (Cr), and the degree of concentration and coordination of experts' opinions were expressed by the coefficient of variation (CV) and the ratio of full scores (K), and Kendall's coefficient of concordance (Kendall's W), respectively. $P < 0.05$ was taken as the difference was statistically significant.

Results

Positivity of Experts

The degree of expert activism was illustrated by the recovery rate of questionnaires in each round, the validity rate, and the rate of experts who made suggestions. 11 questionnaires were dispatched and 11 questionnaires were retrieved in each of the two rounds of expert counseling, with a recovery rate of 100%, and all of them were valid questionnaires, which indicated that the experts' activeness was high. In the first round of expert correspondence, 7 experts (suggestion rate of

63.64%) put forward 26 textual suggestions on the content of the intervention program, and 2 experts (suggestion rate of 18.18%) proffered 2 suggestions in the second round, thereby the experts' opinions converged.

Expert's Familiarity, the Basis for Judgment, and Authority

Cr is determined by the expert's basis of judgment (Ca) and familiarity (Cs) with the content of the consultation, Cr = (Ca + Cs)/2; expert Cr ≥ 0.70 is an acceptable level of confidence, and the larger the Cr, the higher the scientific and credibility of the expert's judgment. In this study, Ca=0.955, Cs=0.964, and Cr=0.960.

Degree of Concentration and Harmonization of Expert Views

The degree of concentration of expert opinion is expressed by mean ± standard deviation (± s), CV, K, and the degree of coordination is indicated by Kendall's W. Generally, the smaller the CV, the smaller the lesser of expert opinion on the entry, CV≤0.25, indicating that the expert opinion is more concentrated. Generally the smaller the CV, the smaller the disagreement of experts on the entry, and the CV ≤ 0.25 for each entry indicates that the expert opinions are more concentrated. Kendall's W assumes values 0 to 1 and generally fluctuates within the range of 0.3 to 0.5, and the larger Kendall's W, the more significant it is after the test ($P < 0.05$), indicating that the degree of harmonization of expert opinions is favorable.

In this study, the significance mean of the first round of Delphi expert advice level 1 entries was 4.40–4.70, the standard deviation was 0.31–0.44, the CV was 0.068–0.100, the K was 0–18.2%, and the Kendall's W was 0.294; the significance mean of the level 2 entries was 4.23–4.91, the standard deviation was 0.30–1.40, and the CV was 0.062–0.236, K of 9.1%-90.9%, and Kendall's W of 0.211; the mean importance of tertiary entries was 4.09–4.91, with a standard deviation of 0.30–1.60, a CV of 0.062–0.273, a K of 27.3%-90.9%, and a Kendall's W of 0.173. Round 2 Delphi Expert Consultation Means of importance for Level 1 entries were 4.89–5.00, with a standard deviation of 0–0.15, a CV of 0–0.031, a K of 63.6%-100%, and a Kendall's W of 0.343; for Level 2 entries the mean of importance was 4.77–5.00, with a standard deviation of 0–0.34, a CV of 0–0.072, a K of 63.3%-100%, and a K of 0.343; and for Level 2 entries it was 4.77–5.00, with a standard deviation of 0–0.34, and a CV of 0–0.072, a K of 63.6%-100%, and a Kendall's W of 0.230, and the mean importance of tertiary entries was 4.64–5.00, with a standard deviation of 0–0.51, a CV of 0–0.109, a K of 63.6%-100%, and a Kendall's W of 0.206, all statistically significant differences ($P < 0.05$), see Table 1. Through the 2 rounds of expert correspondence, the concentration of expert opinions on Level 2 entries was higher and the degree of coordination was better. The coefficient of variation of some tertiary entries in the 1st round is >0.25, which needs to be revised according to the experts' opinions.

Results of Expert Correspondents

Round 1 added 2 entries, modified 14 entries, merged 3 entries, and deleted 7 entries based on expert opinion. Round 2 added 0 entries and modified 2. 3 primary, 10 secondary, and 42 tertiary entries were identified after 2 rounds of Delphi expert consultation for a risk factor intervention program for perimenopausal patients with coronary artery disease based on Health Action Process Orientation Theory (Table 2).

Table 1 Degree of Concentration and Harmonization of Expert Views in the Two Rounds

Event	Target	Kendall's *W*	X^2	*P*
First round	Level 1 indicator	0.294	6.465	0.039
	Level 2 indicator	0.211	30.206	0.004
	Level 3 indicator	0.173	77.819	<0.001
Second round	Level 1 indicator	0.343	7.538	0.023
	Level 2 indicator	0.230	32.945	0.002
	Level 3 indicator	0.206	93.034	<0.001

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Table 2 Risk factor intervention programs for perimenopausal patients with coronary heart disease based on health action process orientation theory

Level 1 entry	Level 2 entry	Level 3 entry
Pre-intentional stage	Hazard perception	During hospitalization, patients and their families are educated about perimenopausal coronary artery disease, and through group lectures by specialists, videos, educational materials, websites, and public platforms, patients are given a correct understanding and acceptance of the problems.
		Inform patients of the possible adverse consequences of irrational behavior (including diet, exercise, psychology, smoking, etc.) with actual cases (cases include pictures, text, models, or videos), such as aggravation of coronary artery disease, aggravation of perimenopausal vasodilatation symptoms, acute myocardial infarction, other cardiovascular and cerebral vascular diseases, and sudden death, etc., thereby arouse patients' attention.
	Expected results	Share authoritative research that confirms the benefits of good self-management behaviors for patients and enhances self-management efficacy.
		Demonstrate typical examples of successful rehabilitation and reinforce the experience of success.
	Action self-efficacy	Tell patients that everyone can manage themselves and alleviate their condition.
		Cardiovascular events can be avoided or minimized through scientific and rational lifestyle, medication management, and psychological adjustment.
Intentional stage	Objective	Facilitate patients to understand and recognize the negative effects of their behavioral habits, achieving a correct understanding of current behavioral styles and setting goals for correction based on their unhealthy behaviors.
	Plan	Exercise plan: Perimenopausal patients with coronary artery disease are suitable for aerobic and resistance exercise, and a personalized exercise prescription is formulated after a comprehensive assessment of cardiorespiratory function and other factors. The prescription includes FITT elements, i.e., form of exercise, frequency, intensity, duration, and precautions.
		① Exercise forms: to ensure the continuity of exercise, choose the patient's preferred exercise, aerobic exercise such as square dancing, walking, jogging, eight-duanjin, pedaling, etc., resistance exercise such as elastic bands, dumbbells, leg lifting, their body weight and so on.
		② Exercise frequency: aerobic exercise 3-5 times per week and resistance exercise 3 times per week on alternate days, developed and adapted to the patient.
		③ Exercise intensity: gradual transition from low to moderate intensity, 60-80% reserve heart rate for aerobic exercise, <20 beats/min increase in resistance exercise compared to resting heart rate, RPE[16] initially <12 and up to 15.
		④ Exercise time: 30-60 minutes for each aerobic exercise.
		⑤ During the hospitalization, patients were taught the correct way to exercise and self-monitoring methods, precautions, and emergency treatment in special cases. Blood pressure was measured before and after exercise, heart rate monitors were worn during exercise, and warm-up and finishing exercises were performed for 5-10 minutes before and after rehabilitation exercises. The importance of self-management and monitoring was emphasized before discharge.
		⑥ Obtain support from family members to assist in monitoring the completion of rehabilitation.
		Diet plan
		① Evaluate the patient's usual eating habits, food intake, and nutritional risks, and develop a nutritional prescription based on the evaluation.
		② Teaching patients to learn to read dietary labels.
		③ Low fat, low cholesterol diet: fat provides no more than 30% of the total energy, of which saturated fatty acids do not exceed 10% of the total energy, minimize fatty meat, meat food, cream, and daily cooking oil consumption control in 20-30 g. Limit the high cholesterol-containing animal food, such as animal offal, squid, fish roe, yolks, and so on. Select foods capable of lowering LDL-C, such as plant sterols, soluble fiber, etc. Decrease the intake of trans fatty acids.
		④ Limit salt, take calcium supplements, and supplement with estrogen-rich foods: people with high blood pressure should consume no more than 6g of salt per day, including that in MSG, preservatives, sauces, and condiments. Get more sunlight and increase milk intake (300ml per day). Eat more estrogen-containing foods such as soybeans, black beans, tofu, soymilk, and soy milk.
		⑤ Adequate intake of dietary fiber: 25-30g/day from vegetables fruits and whole grains. Adequate intake of fresh vegetables (400-500g/d) and fruits (200-400g/d): including leafy greens, cruciferous vegetables, legumes, and fruits.
		Cardiomyopathy
		① Correct understanding of the characteristics of the perimenopausal stage and the severity of the disease suffered.
		② Understanding the current psychological situation of the patient based on psychological scale scores.
		③ Combine work and rest, correctly treat all kinds of conflicts, optimistic attitude towards the body's temporary discomfort, through meditation, yoga, and other soothing moods.
		④ Mildly ill patients who are unable to alleviate their psychological problems through self-regulation and self-direction are given anti-anxiety and depressive drugs as prescribed, and in severe cases, psychiatrists are called in to intervene.
		⑤ Family members give the patient spiritual care and living care.
		⑥ Create a good sleep environment to ensure quality sleep.
		⑦ Patients with a family history of coronary heart disease, diabetes mellitus, and hypertension, regular monitoring of blood lipids, blood pressure, and blood glucose for early detection and treatment.

		Smoking cessation program ① Clarify the hazards of smoking, establish the awareness of active cessation, and have sufficient psychological preparation for quitting smoking. ② Active smoker patients should be made aware that withdrawal symptoms and weight gain are normal during the quitting process. They should employ exercise and other distraction methods to alleviate them and avoid substituting the craving for tobacco with food. For those who have difficulty quitting, they can reduce the amount of cigarettes they smoke, extend the time of the first cigarette of the day, and correct the habit of smoking after meals, in the toilet, in the morning, and before going to sleep. ③ Patients who are passive smokers, stay away from smoking environments and ask family members who smoke to quit together or not to smoke in the same space as the patient. ④ Family assistance in monitoring smoking cessation. Medicatio observation ① Take medication on time, be clear about the name, action, usage, duration, and major adverse effects of the medication used, and learn to monitor themselves. ② Regular outpatient follow-up to monitor liver and kidney function, blood glucose, and blood lipids. ③ Carry necessary first aid medicines, such as nitroglycerin, and keep and use them as required.
	Coping with self-efficacy	Rehabilitation prescriptions are distributed to patients, who are taught the proper way to carry out the prescriptions and are instructed to correct any points that are not understood or are incorrect promptly. In the folow-up process, the patient's progress is recognized promptly to improve self-confidence.
Action stage	Appearance	Hand out rehabilitation manuals and keep rehabilitation records, including the type and amount of food and drink eaten each day, sleep time, medication, whether or not you smoke, blood pressure before and after exercise, pulse rate, time and mode of exercise, and how you feel about yourself. Establish a WeChat group, provide contact numbers of rehabilitation centers, and inform the contact methods and self-coping measures in case of abnormal situations. If the target is not met, record the reason for non-completion.
	Remain	Answers online, over the phone, or face-to-face to questions that arise during a patient's recovery. Rehabilitation knowledge is distributed weekly in the WeChat group, and every 4 weeks the rehabilitation outpatient clinic follows up, reassesses, and adjusts the rehabilitation prescription. Non-material incentives were provided to patients who completed every four weeks as required, such as the gift of a 6-minute walk test, cardiopulmonary exercise test, cardiac ultrasound, etc., and a certificate of completion was conferred to patients who completed 12 weeks as stipulated, and displayed in the group.
	Recurring	Help the patient discover the reasons for failing to complete the prescription as required by giving persuasion, encouragement, adjustment, and supervision.
	Restoring self-efficacy	Evaluate patients' completion, praise those who do well, show results, and enhance the confidence of patients and other patients.

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Discussion

The risk factor intervention program for perimenopausal patients with coronary heart disease based on the theory of health action process orientation is scientifically sound. Firstly, this study reviewed domestic and international literature, guidelines, and qualitative interviews, and combined with clinical practice to lay the theoretical and practical foundation for the construction of the program; second, this study selected 11 experts from 6 hospitals in 5 provinces and cities nationwide to conduct a correspondence questionnaire on the importance and operability of the program. 11 experts were engaged in different fields of clinical nursing, clinical medical care, rehabilitation technologists, and nursing research and were familiar with cardiovascular diseases. The 11 experts were familiar with different fields of clinical nursing, clinical medicine, rehabilitation technicians, and nursing research, and were also familiar with cardiovascular diseases, so they were representative to a certain extent.

The questionnaires of the two rounds of expert correspondence had a 100% effective recovery rate, with 7 experts making suggestions totaling 26 articles in the first round and 2 experts making suggestions totaling 2 articles in the second round, indicating high motivation. Additionally, the Cr of the two rounds of correspondence was 0.70, indicating high authoritativeness. The research team conducted brainstorming based on the evaluation results and suggestions of the experts to modify and enhance the intervention program and finally determined the intervention program. Therefore, this intervention program is scientifically valid.

The necessity, significance, and feasibility of constructing a risk factor intervention program for perimenopausal patients with coronary heart disease based on the theory of health action process orientation. Perimenopause is an important "turning point" in a woman's life from the time she approaches menopause and develops endocrine, biological, and clinical characteristics associated with menopause until 1 year after her last menstrual period.

During this period, due to the gradual decline of female ovarian function, estrogen level fluctuates and decreases significantly, high blood lipids, high blood glucose, hypertension, coronary heart disease, etc., coupled with the presence of various factors such as family changes, role changes, children's employment, work pressure, etc., resulting in the patient's somatic and psychological discomfort, such as the lack of proper guidance and intervention, resulting in coronary heart disease angina pectoris, and other symptoms of aggravation, anxiety and depression deterioration,[17,18] and even death, suicide and other accidents.

However, the majority of the literature both domestically and internationally focuses on the study of perimenopausal coronary heart disease risk factors, featuring fewer specific intervention programs. These programs are confined to a certain aspect and lack comprehensive interventions, so it is highly necessary to construct a comprehensive intervention program for perimenopausal coronary heart disease patients' risk factors. There are five major prescriptions for cardiac rehabilitation, namely exercise prescription, diet prescription, drug prescription, psychological prescription, and smoking cessation prescription, cardiac rehabilitation has direct and indirect impacts on vascular improvement and other aspects, ameliorates the risk factors of patients with coronary heart disease, and alleviates the adverse psychological condition.[19] Particularly, the gradual withdrawal of hormones in perimenopausal women causes physical and psychological discomfort, and comprehensive interventions such as psychology, diet, exercise, and medication can help patients pass through this special physiological stage smoothly.

In qualitative interviews, patients deem rehabilitation adherence as difficult, and numerous kinds of literature have shown low adherence to cardiac rehabilitation. In this program, through comprehensive assessment, based on the theory of health action process orientation, starting from the five prescriptions of rehabilitation, the pre-intention stage, from the admission through the mission, pictures, videos, words, etc., enabling the patients feel the possible consequences of bad habits, establish a correct attitude towards healthy life, and attain psychological recognition; the intention stage, together with the medical staff to determine the goals, develop an intervention plan, learn the correct rehabilitation In the action stage, we overcome the difficulties encountered in the rehabilitation process, join the WeChat group, punch cards regularly, and the rehabilitation team encourages and monitors the rehabilitation of patients through online, telephone, and outpatient clinics to promote patients to improve their adherence to rehabilitation. Therefore, a risk factor intervention program for perimenopausal coronary heart disease patients based on the health action process orientation theory and the five prescriptions of cardiac rehabilitation is highly important and feasible.

Analysis of risk factor intervention program for perimenopausal patients with coronary heart disease based on health action process orientation theory. The decline of ovarian function in perimenopausal women results in the decrease of estrogen secretion, and estrogen exerts the effect of adjusting lipid metabolism, elevating high-density lipoproteins, and lowering low-density lipoproteins and blood glucose. When perimenopausal women's estrogen level is down-regulated, the metabolism of lipids, blood glucose, and blood calcium is abnormal, which activates the patient's cardiac autonomic nervous system active, cardiovascular regulation function, the feedback effect weakens, and through the influence on the enzyme system, norepinephrine is increased, and dopamine is relatively insufficient, especially to regulate the function of vascular smooth muscle cells and endothelial cells and vasodilatory factor activity is reduced, and a higher amount of prostaglandins, which leads to high and low blood pressure, fast and slow heart rate, and unstable fluctuations.[20] Prone to hyperlipidemia, hyperglycemia, hypertension, coronary heart disease, obesity, perimenopausal syndrome, anxiety and depression, osteoporosis[21] a variety of other conditions, sudden physical diseases aggravate the psychological problems, interaction, mutual influence, vicious circle.[17,22]

Therefore, in developing an intervention program for risk factors in perimenopausal patients with coronary heart disease, the first step is to provide patients with multiple channels of knowledge about the disease and psychological guidance suitable for this age group, such as meditation, yoga, exercise, etc., to enable them to accurately understand the disease they are suffering from at present, to alleviate the situation of anxiety and depression, and to obtain the support of their families, and to request the intervention of psychologists when necessary.

Secondly, perimenopausal women are suitable for aerobic and resistance exercise due to the elevation of blood lipids, blood glucose, blood pressure, body mass index, etc.[23,24] Picking the individual's preferred exercise in terms of form, gradually advancing from low-intensity to moderately strenuous in terms of intensity, and adorned with a heart rate monitor during exercise, or even performing flexible remote cardiac monitoring, helps guarantee the safety and validity of the exercise through self-supervision and remote management.

Third, due to the patient's estrogen loss, causing osteoporosis, elevated blood pressure, etc., dietary supplements containing estrogen foods such as soybeans, black beans, soybean skin, soybean milk, etc., through more sun exposure, drinking milk, etc., to alleviate osteoporosis, and to control the intake of fat, cholesterol, sodium, etc., to reduce blood lipids, blood pressure, blood glucose. Fourth, studies have shown that female smoking synergizes with other risk factors,[5] increasing the risk of cardiovascular disease. Through qualitative interviews and numerous domestic studies, it was found that most perimenopausal women in China are passive smokers, so it is necessary to require the cooperation of family members who smoke to quit smoking and stay away from smoking environments when necessary.

HAPA proposes that the adoption, initiation, and maintenance of health behaviors is a stage-by-stage process, and the HAPA model recognizes that individuals at different stages are facing different problems or difficulties, which is conducive to the classification of individuals with different internal and psychological statuses into different groups for behavioral intervention. Individuals with diverse mental illnesses fall into different stages, giving a basis for personalized intervention of health behaviors.[25]

For patients in the pre-intention stage, the intervention emphasizes the perception of danger and the expectation of results, enabling the patients to be aware of the danger of not engaging in good self-management behaviors, thereby triggering the attention of the patients, and through the successful patient's personal experience, the patients can perceive the benefits of good self-management behaviors. For patients in the intention stage, the interventionist will assist the patient in developing specific goals and plans and will take into account the patient's situation, such as age, physical fitness, preferences, family support, etc., to formulate an individualized self-management plan for the patient. After patients enter the action phase, we will encourage them to upload their exercise, diet, and smoking cessation plans, and give them regular guidance.

In addition, this study employs the method of enhancing self-efficacy throughout the process of intervention,[26] such as involving patients with better self-management behaviors to elaborate on their feelings in the pre-intentional stage, allowing patients to affirm their promises on their self-management plans in the intentional stage, and encouraging and non-material rewards for the aspects that the patients have done well in the action stage to improve the confidence of the patients in recovery, thereby maintain the self-management behaviors of the patients.

Conclusion

In the present research, we developed a risk factor intervention program for perimenopausal individuals with coronary heart disease based on the theory of health action process orientation, using a preliminary review of domestic and international literature and guidelines, retrospective analysis, and qualitative interviews, as well as clinical practice and expert correspondence.

The content of the construction focuses on the characteristics of perimenopausal patients with coronary heart disease, the development of targeted interventions, and under the guidance of the health action process orientation theory, phased intervention to improve the patient's adherence to rehabilitation, to achieve the purpose of behavioral change, to reduce the patient's coronary heart disease controllable risk factors, and the intervention program is necessity, relevance, and scientifically valid. However, this study merely accomplished the program construction, the next step is to conduct a pilot study in clinical practice, and its clinical practice guidance role needs to be explored.

Data Sharing Statement

The contents underlying the research text are included in the manuscript.

Ethics Committee Approval

This study was approved by the Hospital Ethics Committee of Jiaxing No. 2 Hospital (Approval Number JXEY2024-092-01). All methods were carried out in accordance with Declaration of Helsinki.

Consent to Participate

Patients were not required to give informed Consent to the study because the analysis used anonymous clinical data that Were obtained after each patient agreed to treatment by written consent.

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Disclosure

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