

## Original Article

# Comprehensive nursing intervention on negative emotions, quality of life, and cardiopulmonary function in patients with coronary heart disease

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**Abstract:** Objective: The aim of the current study was to explore the effects of comprehensive nursing intervention on anxiety and depression, quality of life, and cardiopulmonary function in patients with coronary heart disease. Methods: According to different nursing methods, 129 patients with coronary heart disease were randomly divided into the conventional nursing group and comprehensive nursing group. The comprehensive nursing group received psychological intervention and continuing nursing care based on cognitive behavioral therapy and based on conventional nursing. Scores of the self-rating anxiety scale (SAS) and self-rating depression scale (SDS), quality of life assessment (SF-36), myocardial performance index (Tei index), measured by tissue Doppler imaging (TDI) after intervention, and 6-minute walking test results were recorded and compared between the two groups at admission and 6 months after discharge. Results: Before and after intervention, SAS and SDS scores of the comprehensive nursing group were significantly lower than those of the conventional nursing group (both  $P < 0.05$ ). In addition, quality of life scores, Tei index, and 6-minute walking test results in the comprehensive nursing group were notably improved, compared to those in the control group (all  $P < 0.05$ ). Conclusion: Compared with conventional nursing intervention, comprehensive nursing intervention can effectively relieve anxiety and depression, improve quality of life, and strengthen cardiopulmonary function in patients.

**Keywords:** Coronary heart disease, nursing intervention, depression, anxiety, quality of life, cardiopulmonary function

## Introduction

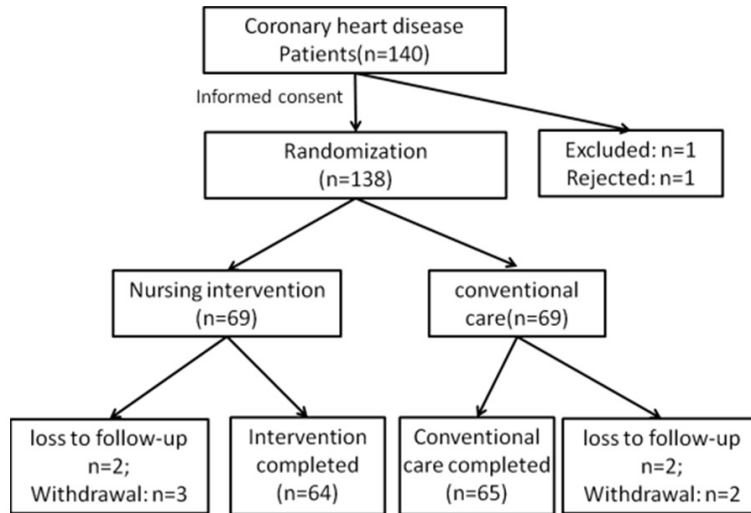
In the past 40 years, morbidity and mortality rates of cardiovascular diseases have risen. This may be due to environmental pollution, aging of the population, and change in lifestyles. In 2014, 44.60% and 42.51% of the deaths of rural and urban residents in China were caused by cardiovascular diseases. Cardiovascular diseases have become the first cause of deaths among residents in China [1]. Coronary heart disease (CHD) is a major cardiovascular disease. Nearly half of cardiovascular deaths can be attributed to CHD. Thus, it has become a serious public health problem [1, 2]. Coronary heart disease is a lifelong disease. With the development of the disease, incidence of depression and anxiety is significantly higher than that in the general population [3, 4]. One meta-analysis found that the prevalence of

depression among CHD patients in China reached 51% [5]. Negative emotions, such as depression and anxiety, can further adversely affect prognosis and quality of life of patients with coronary heart disease [6].

Comprehensive nursing intervention refers the use of multiple nursing methods in different aspects or various related problems of the disease. Commonly used methods include psychological intervention and continuing nursing care [7]. Moreover, it has been proven to improve negative emotions, quality of life scores, and prognosis in the nursing care of a variety of diseases [8, 9].

Many studies have shown that psychological intervention can alleviate negative emotions, such as depression and anxiety, in patients with coronary heart disease, improving quality

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**Figure 1.** Inclusion flowchart of research subjects.

of life and cardiopulmonary function. However, results have not been consistent due to differences in research design and evaluation indicators [10-12]. One meta-analysis reported by Sun Yuhua in China included 7 articles and 9 articles concerning the effects of psychological intervention on anxiety and depression, respectively. Results showed that psychological intervention can markedly relieve anxiety and depression in CHD patients [10]. In another meta-analysis, psychological intervention showed no significant effects on negative emotions in patients with coronary heart disease [12]. In addition, other studies have shown that continuing nursing care for discharged CHD patients can improve negative emotions and cardiopulmonary function [13, 14]. The current study evaluated the roles of comprehensive nursing intervention in nursing care of CHD patients, aiming to understand the impact on patient anxiety, depression, other negative emotions, and quality of life, as well as cardiopulmonary function. The current study aimed to provide a scientific basis for improving the nursing effects of coronary heart disease.

## Materials and methods

### Research subjects

Research subjects included stable angina patients, hospitalized in the Third Hospital of Hebei Medical University, from January 2017 to June 2017. Patients with stable angina account for most patients with coronary heart disease [15]. After admission to the hospital, the pa-

tients underwent elective coronary angiography procedures for confirmation before interventional or conservative treatment.

**Inclusion criteria:** All patients met the diagnostic criteria for chronic stable angina pectoris [15, 16]; After admission, patients were treated with conservative drug therapy or percutaneous coronary intervention (PCI); Age of patients was  $\geq 18$  and  $< 75$  years old; Patients were able to cooperate with the questionnaires and related tests with no mental illness or consciousness disorders; Patients signed informed

consent and voluntarily participated in this study.

**Exclusion criteria:** Patients with cardiogenic shock; Patients with severe arrhythmia; Patients needing coronary artery bypass graft surgery; Patients with a history of previous mental illness; Patients with serious diseases of other organs; Patients with acute coronary syndrome or myocardial infarction. This study was approved by the Ethics Committee of the Third Hospital of Hebei Medical University.

### Grouping and nursing intervention

During the study period, a total of 140 patients with CHD were admitted, including 1 patient that rejected the study and 1 patient with a malignant tumor. The two patients were excluded. A total of 138 patients were included and randomly divided into the comprehensive nursing group and conventional nursing group, according to a random number table. There were 69 cases in each group. After grouping, in the comprehensive nursing group, 2 patients were lost to follow-up and 3 patients withdrew from the study. In the conventional nursing group, 2 patients were lost to follow-up and 2 patients withdrew from the study. In the end, 64 patients in the comprehensive nursing group and 65 patients in the conventional nursing group were included for analysis, as shown in **Figure 1**.

The conventional nursing group received routine treatment and care during hospitalization,

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including administration of drugs for symptomatic treatment to dilate blood vessels, promote blood circulation, inhibit platelet aggregation, lower blood lipid, stabilize plaque, and reduce myocardial oxygen consumption. If the indications were met, the patients would be treated with PCI and followed by necessary anti-coagulation. The patients needed to continue taking the above medications for CHD, according to the conditions after discharge.

Aside from conventional nursing, the comprehensive nursing group also received the following nursing methods. These included observation of patient conditions based on the nursing degree, medication nursing, and specialized nursing based on treatment methods, such as preoperative and postoperative nursing care for interventional surgery, as well as guidance for diets and return visits before discharge. Based on routine nursing, the comprehensive nursing group received comprehensive nursing intervention based on psychological intervention, including: (1) Regular health education: After hospitalization, education manuals of cardiovascular disease compiled by the department were issued. Physicians and nurses in the department regularly carried out CHD-related health education lectures, once or twice a week, and answered patient questions during treatment; (2) Psychological intervention: After admission, the psychological pressure of patients was understood and the severity of the risk of depression was determined through communication with patients and their families. Individualized cognitive behavioral psychological nursing care was then carried out twice a week for 30 minutes each time. According to the different psychological status of patients, the nursing staff guided patients in gradually learning to respond reasonably, correctly understand themselves, strive for social support, rebuild self-esteem, and mobilize subjective initiative. Moreover, they also guided patients in carrying out progressive relaxation training, correcting errors with right rational cognition, and rebuilding cognitive structure; (3) Continuing nursing care: After discharge, patients received extended nursing intervention for 6 months. Patients were followed up once a week by telephone, WeChat, or other means of communication. They received targeted guidance for nursing and functional exercise, provided according to patient conditions. The main con-

tents of guidance included teaching the patients to conduct self-care, such as exercise of limb function, rational drug use, and nutrition guidance, as well as continuing to instruct patients in relaxation training. A more comprehensive assessment of patient conditions was conducted at the return visit. The continuing nursing plan was revised based on the assessment. In the current study, psychological intervention personnel had participated in relevant psychological intervention training.

### *Evaluation indicators*

Psychological indicators: Depression and anxiety statuses were evaluated by the Zung self-rating depression scale (SDS) and self-rating anxiety scale (SAS), respectively, within 2 days after admission and 6 months after discharge [17, 18]. SDS scores < 50 indicated no depression, scores between 50 and 59 indicated mild depression, scores between 60 and 69 indicated moderate depression, and scores  $\geq$  70 indicated severe depression. SAS scores < 50 were classified as normal, scores between 50 and 59 were classified as mild anxiety, score between 60 and 69 were classified as moderate anxiety, and scores  $\geq$  70 were classified as severe anxiety.

Quality of life status: Quality of life was assessed by the SF-36 scale within 2 days after admission and 6 months after discharge [19]. This scale contained 36 entries and was divided into 8 items, including physical role function, physical function, bodily pain, general health perceptions, vitality, social role function, emotional role function, and mental health. The total score of each item was 100 points. Higher scores indicate better quality of life.

Cardiac function indicators: Within 2 days after admission and 6 months after discharge, cardiac ultrasonography procedures were performed on the patients with ultrasonic diagnostic instruments. These measured the Tei value of the left ventricle. By marking the diastolic blood flow spectrum of mitral valve orifice obtained by pulsed Doppler ultrasound, the two periods and the pumping time phase were directly read from the figures and calculated. Under the conditions of a pulsed Doppler, blood flow spectrums of mitral and aortic valve orifice were obtained from the apical four-chamber view and apical five-chamber view. The timew

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from the stop point of the mitral valve orifice blood flow spectrum during diastole to the starting point of next blood flow spectrum (a) and the duration of the aortic valve orifice blood flow spectrum during systole (b) were measured, along with the left ventricular Tei index = (a-b)/b [20]. This index was combined with systolic and diastolic times to evaluate cardiac function. Compared with other cardiac function indicators, it was simple and easy to perform. It was unaffected by heart rate, ventricular geometry, and cardiac load. Thus, it could fully reflect the overall function of the left heart [21].

Six-minute walking test (6MWT): The test was performed within 3 days after admission and 6 months after discharge. The patients walked back and forth on a 20-meter indoor corridor. The farthest distance that patients could walk in 6 minutes was measured. The test was performed twice in the morning. The test time was basically the same every time. The best value among the results was taken. This study also used the test to assess patient cardiopulmonary function from the perspective of exercise tolerance [22].

### Statistical analysis

Measurement data are expressed as mean  $\pm$  standard deviation. The mean between the two groups was compared using two independent samples t-tests. Count data are represented by the composition ratio. Differences were compared by the two-sided  $\chi^2$  test. A paired t-test was used to compare changes in depression, anxiety, quality of life and cardiopulmonary function scores, before and after intervention, in the two groups. The statistical significance level was set as bilateral  $\alpha = 0.05$ . SPSS 20.0 software was used for statistical analysis of the data.

## Results

### General information of patients in two groups

Individual and clinically relevant characteristics of the conventional nursing group (n = 65) and comprehensive nursing group (n = 64) are presented in **Table 1**. There were no significant differences in age, gender distribution, smoking, education levels, economic status, medical insurance, comorbidity, and treatment methods between the two groups. Basic data was comparable.

### Comparison of anxiety and depression status before and after intervention in the two groups

SDS scores of the comprehensive nursing group and conventional nursing group at admission were  $62.50 \pm 25.90$  and  $64.15 \pm 33.92$ , respectively. SAS scores in the two groups were  $60.23 \pm 34.44$  and  $62.54 \pm 35.07$ , respectively. Differences were not statistically significant (all  $P > 0.05$ ). Compared with those at admission, SAS and SDS scores of the comprehensive intervention group decreased markedly after 6 months of discharge (all  $P < 0.001$ ). Moreover, SDS scores of the conventional nursing group decreased notably ( $P = 0.011$ ), but the decline in the SAS scores did not reach a significant level ( $P = 0.053$ ). Differences in SAS and SDS scores, before and after intervention, in the comprehensive nursing group were higher than those in the conventional nursing group (all  $P < 0.05$ ). See **Table 2**.

### Comparison of life quality scores before and after intervention in two groups

Changes in life quality in two groups, before and after the intervention, are shown in **Table 3**. There were no significant differences between the two groups in the scores of each item before intervention (all  $P > 0.05$ ). Compared with pre-intervention, scores of patients in the comprehensive nursing and conventional nursing groups were significantly improved after 6 months of discharge (all  $P < 0.05$ ). At the end of intervention, in addition to physical role function, improvements in other items in the comprehensive care group were also notably better than those in the conventional care group ( $P < 0.05$ ).

### Comparison of cardiopulmonary function scores before and after intervention in the two groups

The Tei index before intervention in the comprehensive nursing group and conventional nursing group was  $0.6 \pm 0.37$  and  $0.67 \pm 0.39$ , respectively, with no significant differences. After hospitalization and continuing nursing intervention, the Tei index of the comprehensive nursing group was significantly decreased ( $P = 0.008$ ), while improvements in the conventional nursing group did not reach noteworthy levels. Declined levels of the Tei index after intervention in the comprehensive nursing group were significantly better than those in the

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**Table 1.** Comparison of general characteristics between the two groups

Characteristics	Comprehensive nursing group (n = 64)	Conventional nursing group (n = 65)	$\chi^2/t$	P
Age (year)	60.2 ± 9.4	59.2 ± 9.9	0.603	0.548
Gender (n, %)				
Male	35 (54.69)	40 (61.54)	0.622	0.430
Female	29 (45.31)	25 (38.46)		
Education level (n, %)				
Junior high school and below	17 (26.56)	13 (20.00)	1.074	0.584
Senior high school/technical secondary school	32 (50.00)	38 (58.46)		
Junior college and above	15 (23.44)	14 (21.54)		
Monthly family income (n, %)				
< 3,000	7 (10.94)	11 (16.92)	1.218	0.544
3,000-5,000	30 (46.88)	31 (47.69)		
> 5,000	27 (42.19)	23 (35.38)		
Medical insurance (n, %)				
No	5 (7.81)	9 (13.85)	1.213	0.271
Yes	59 (92.19)	56 (86.15)		
Smoking (n, %)				
No	16 (25.00)	24 (36.92)	2.143	0.143
Yes	48 (75.00)	41 (63.08)		
Hypertension (n, %)				
No	17 (26.56)	15 (23.08)	0.210	0.647
Yes	47 (74.44)	50 (76.92)		
Diabetes (n, %)				
No	39 (60.94)	45 (69.23)	0.976	0.323
Yes	25 (39.06)	20 (30.77)		
Treatment method (n, %)				
Conservative treatment	44 (68.75)	49 (75.38)	0.706	0.401
Interventional treatment	20 (31.25)	16 (24.62)		

**Table 2.** Comparison of depression and anxiety improvement between the two groups

Item	Intervention	Comprehensive nursing group (n = 64)	Conventional nursing group (n = 65)	t	P
SDS	Pre-intervention	62.50 ± 25.90	64.15 ± 33.92	0.310	0.766
	Post-intervention	50.35 ± 27.65	59.48 ± 28.44		
	Difference	12.15 ± 20.52	4.67 ± 14.41	2.399	0.018
	t	7.159	2.613		
	P	< 0.001	0.011		
SAS	Pre-intervention	60.23 ± 34.44	62.54 ± 35.07	0.377	0.707
	Post-intervention	50.35 ± 26.31	58.67 ± 29.75		
	Difference	9.88 ± 19.17	3.87 ± 15.81	1.944	0.027
	t	4.123	1.973		
	P	< 0.001	0.053		

Note: SDS, self-rating depression scale; SAS, self-rating anxiety scale.

conventional nursing group (P = 0.030). Compared with pre-intervention, 6-minute walking distances of the comprehensive nurs-

ing group and conventional nursing group increased clearly after intervention. However, elevated levels in the comprehensive interven-

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**Table 3.** Comparison of life quality improvement between the two groups

Life quality	Intervention	Comprehensive nursing group (n = 64)	Conventional nursing group (n = 65)	t	P
Physical function	Pre-intervention	63.46 ± 36.62	65.12 ± 37.95	0.253	0.801
	Post-intervention	74.83 ± 34.43	68.79 ± 29.02		
	Difference	11.37 ± 22.65	3.67 ± 11.58	2.437	0.016
	P	0.006	0.013		
Role physical	Pre-intervention	30.79 ± 18.21	32.38 ± 20.49	0.466	0.642
	Post-intervention	39.66 ± 20.42	36.72 ± 19.49		
	Difference	8.87 ± 17.78	4.34 ± 9.60	1.765	0.080
	P	< 0.001	< 0.001		
Body pain	Pre-intervention	46.77 ± 20.54	48.21 ± 19.36	0.410	0.683
	Post-intervention	54.80 ± 21.97	50.19 ± 20.17		
	Difference	8.03 ± 20.25	2.48 ± 6.36	2.017	0.037
	P	< 0.001	0.003		
General health	Pre-intervention	49.06 ± 25.49	52.12 ± 27.57	0.658	0.512
	Post-intervention	58.69 ± 27.37	55.13 ± 20.06		
	Difference	9.63 ± 23.77	3.01 ± 10.18	2.062	0.041
	P	0.002	0.021		
Energy	Pre-intervention	39.25 ± 23.22	41.76 ± 26.62	0.570	0.569
	Post-intervention	51.19 ± 37.57	46.03 ± 27.84		
	Difference	11.94 ± 23.25	4.27 ± 11.18	2.394	0.018
	P	< 0.001	0.003		
Social activities	Pre-intervention	50.08 ± 25.92	54.29 ± 30.37	0.846	0.399
	Post-intervention	60.40 ± 23.74	57.48 ± 28.21		
	Difference	10.32 ± 26.82	3.19 ± 7.81	2.069	0.041
	P	0.003	0.001		
Emotional function	Pre-intervention	52.27 ± 31.36	55.52 ± 34.27	0.562	0.575
	Post-intervention	63.39 ± 37.28	58.81 ± 20.59		
	Difference	11.12 ± 30.24	3.29 ± 7.01	2.033	0.044
	P	0.004	0.001		
Mental health	Pre-intervention	38.19 ± 21.48	42.31 ± 29.25	0.911	0.364
	Post-intervention	51.10 ± 29.29	46.83 ± 26.04		
	Difference	12.91 ± 31.20	4.52 ± 11.25	2.038	0.044
	P	0.002	0.047		

tion group were significantly higher than those of the conventional nursing group (P = 0.005). See **Table 4**.

### Discussion

In recent years, incidence of CHD has increased. This may be due to environmental, social, and lifestyle changes, as well as other factors. It has become a chronic disease that seriously affects the health of Chinese residents. Most CHD patients are middle-aged and elderly people. Physical function has severely declined and they need to receive long-term treatment. Thus, they are prone to negative emotions,

such as depression and anxiety. Based on previous studies, negative emotions are not only risk factors for CHD, but also have adverse effects on the development, treatment, and prognosis of CHD [23-25]. Previous studies have shown that depression can cause neurological, immune, and endocrine system dysfunction in CHD patients, leading to cardiac autonomic nervous system dysfunction. This causes excessive secretion of catecholamines, increased inflammatory activity, and lipid metabolism disorders, aggravating patient conditions [26]. In recent years, comprehensive nursing intervention has been increasingly widely used in clinical nursing care. This meth-

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**Table 4.** Comparison of cardiopulmonary function improvement between the two groups

Item	Intervention	Comprehensive nursing group (n = 64)	Conventional nursing group (n = 65)	t	P		
The Tei index	Pre-intervention	0.64 ± 0.37	0.67 ± 0.39	0.448	0.655		
	Post-intervention	0.53 ± 0.41	0.65 ± 0.43				
	Difference	0.11 ± 0.32	0.02 ± 0.08			2.201	0.030
	t	2.750	1.928				
	P	0.008	0.058				
The 6-minute walking distance	Pre-intervention	352.74 ± 142.37	366.39 ± 154.27	0.522	0.603		
	Post-intervention	438.99 ± 182.64	433.72 ± 192.06				
	Difference	76.25 ± 39.84	57.33 ± 35.29			2.856	0.005
	t	15.31	13.10				
	P	< 0.001	< 0.001				

Note: Tei index, myocardial performance index.

od mainly applies psychological, continuing, and other nursing methods to intervene with the mind, body, and spirit of patients [7, 27]. Many studies have shown that comprehensive nursing intervention can help improve the mood, quality of life, and prognosis in patients with multiple diseases [28, 29]. Therefore, psychological intervention may also play an important complementary role in diagnosis and treatment of coronary heart disease.

Aiming to improve the nursing effects of coronary heart disease, a variety of intervention methods have been explored in CHD patients, such as behavior, cognition, and continuing care. Evaluations include negative emotions, quality of life, cardiopulmonary function, and other clinical indicators. Cognitive behavioral intervention is a kind of psychological intervention therapy used to change bad cognition by changing thinking and behavior, thus eliminating negative emotions and behaviors. Continuing nursing refers to helping patients receive different levels of continuing care in various health care places (such as hospitals, communities, families) and the same place (such as hospital departments) under the premise of action design. The two nursing intervention methods have been widely used in the nursing care of various diseases in recent years [30-32]. In this study, results showed significantly improved patient depression, anxiety, and quality of life scores using cognitive behavior-based psychological nursing and continuous nursing during and after hospitalization. Results were in accord with the results of other domestic and foreign studies [33]. One systematic evaluation study summarized the results of

12 randomized controlled trials, showing that differences in the standard deviation of depression, anxiety, and quality of life scores between the cognitive behavioral therapy group and control group were significant [34]. However, results of current psychological intervention are not the same for negative emotions and quality of life in CHD patients. For example, a recent meta-analysis, involving 5 studies, showed that psychological intervention can significantly relieve the symptoms of depression in CHD patients, but cannot improve patient anxiety, quality of life, and related clinical indicators, such as incidence of myocardial infarction and revascularization [24]. In general, due to different intervention methods, patient characteristics, evaluation indicators, randomization process, and analysis methods, the effects of psychological interventions on negative emotions and quality of life in CHD patients can differ and require further exploration.

Cardiopulmonary function and quality of life levels in CHD patients are closely related. Early studies have shown that poor exercise endurance is notably associated with decreased quality of life in patients with heart failure [35]. Therefore, the current study also evaluated the impact of comprehensive nursing intervention on cardiopulmonary function in CHD patients. At present, in studies evaluating cardiopulmonary function in CHD patients, the indicators are not completely consistent, including pulmonary function (such as FEV1), 6-minute walking tests, left ventricular ejection fraction, and Tei index [36, 37]. Of these, the Tei index accounts for the ventricular diastole and systole, comprehensively, reflecting overall heart function.

Therefore, the Tei index and 6-minute walking tests were used as evaluation indicators of cardiopulmonary function in this study. Results showed that psychological intervention based on cognitive behavior and continuing nursing could also significantly improve the cardiopulmonary function of patients, in accord with results of other studies [38]. This suggests that comprehensive nursing intervention can not only improve patient negative emotions and quality of life scores, but also further reverse negative emotions brought on by adverse effects, improving physiological indicators.

An advantage of the current study was the use of random assignment that allowed the comprehensive nursing group and conventional nursing group to maintain balance and comparability in baseline characteristics. However, there were still some limitations. For example, a blinding design was not carried out. Thus, the influence of certain biases could not be avoided. In addition, all research subjects were patients with stable angina. In future studies, it is necessary to use larger sample sizes of randomized controlled intervention trials and clear evaluation indicators, evaluating the effects of comprehensive nursing intervention on improving negative emotions, quality of life, and cardiopulmonary function in CHD patients. Future studies will provide more powerful evidence concerning the effects of comprehensive nursing intervention on coronary heart disease nursing care.

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### Disclosure of conflict of interest

None.

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