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Effect of Psychological Education Combined with Progressive Muscle Relaxation Training on the Symptom Cluster and Rehospitalization Rate of Elderly Patients with Coronary Heart Disease

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Abstract: *Objective:* To investigate the effect of psychological education combined with progressive muscle relaxation training on the symptom cluster and rehospitalization of elderly patients with coronary heart disease. *Methods:* This study is a longitudinal randomized controlled study involving 140 elderly patients with coronary heart disease. The patients were divided into two groups: an intervention group and a control group, with 70 cases in each group, via random number table. The patients in the control group received routine nursing, whereas those in the intervention group received psychological education combined with progressive muscle relaxation training for 4 weeks on the basis of routine nursing. The effect of the intervention was evaluated before intervention, at the end of 1 month, 3 months, and 6 months after intervention. *Results:* At the end of 1 month, 3 months, and 6 months, the sleep, fatigue, anxiety, and functional status of the patients in the intervention group were significantly better than those of the control group, with statistical significance difference ($P < 0.05$). The rehospitalization rate of the intervention group was lower than that of the control group, and the difference was statistically significant ($X^2 = 10.685$, $P = 0.001$). *Conclusion:* Psychological education combined with progressive muscle relaxation training is effective in alleviating the symptom cluster of elderly patients with coronary heart disease and reducing their rehospitalization rate; thus, it should be popularized.

Keywords: Psychological education; Progressive muscle relaxation training; Elderly; Coronary heart disease (CHD); Sleep disorders; Fatigue; Anxiety; Functional status

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1. Introduction

Coronary heart disease (CHD) is a common organic cardiovascular disease in the elderly. It is mainly caused by myocardial damage due to the imbalance between coronary blood flow and myocardial demand, resulting in a series of symptoms. These symptoms often coexist and influence each other, collectively referred to as symptom cluster [1].

Symptom cluster management is a research hotspot of scholars at home and abroad. Management

measures include diet management, psychological intervention, relaxation training, exercise, music therapy, etc. Existing research has achieved certain effect, but most of the research subjects were cancer patients. Symptom cluster is a new concept in the nursing field, and there are several intervention studies on symptom cluster in elderly patients with CHD.

The purpose of this study was to investigate the effectiveness of psychological education combined with progressive muscle relaxation training (PMRT) compared with conventional care in alleviating the symptoms and rehospitalization of elderly patients with CHD.

2. Methods

2.1. Setting and samples

From January 2020 to December 2020, 140 elderly patients with CHD, who were hospitalized for the first time in the Department of Cardiology, Affiliated Hospital of Hebei University, were selected as subjects in this study.

Based on the principle of randomization, these patients who met the inclusion criteria were divided into the intervention group and the control group using a random number table, with 70 cases in each group. In the intervention group, there were 38 male patients and 32 female patients, aged 67.65 ±7.02 years, with 39 cases living with their spouse. In the control group, there were 37 male patients and 33 female patients, aged 67.98 ±7.13 years, with 38 cases living with their spouse. There was no significant difference in terms of the demographic variables and medical variables between the two groups ($P > 0.05$).

The inclusion criteria were as follows: (1) age ≥ 60 years old; (2) clinical diagnosis of CHD [2]; (3) no mental and cognitive disorders, with normal communication skills; (4) informed consent given. The exclusion criteria were as follows: (1) patients with severe infection; (2) patients with serious liver and kidney diseases or tumor history; (3) patients with systemic immune system diseases or connective tissue diseases. This study has been validated by the ethics committee of our institution.

2.2. Intervention

The patients in the control group received routine care. For the patients in the intervention group, on the basis of routine nursing, they received psychological education combined with progressive muscle relaxation training (PMRT) for 4 weeks. The intervention included the following: (1) psychological education, in which the educational content was based on previous literatures, and patients' feelings were modified through stress reduction and adaptive behavior; it comprised of psychological factors and disease related information, symptom cluster discussion, and self-health care management; the aforementioned contents were printed out as publicity materials, and the patients were talked to face to face twice a week, 40 minutes each time, for 4 weeks; (2) PMRT, in which the PMRT process was explained to the patients, and the patients were guided in their preparation before training as well as encouraged to be involved in serious training; in a quiet and comfortable environment along with suitable temperature and humidity, the patients were instructed to rest in a supine position and concentrate to eliminate distractions; the patients were then guided to follow the self-relaxation course (published by the Chinese Medical Association Audiovisual Press) for PMRT, in which they were encouraged to practice once every night before going to bed for 4 weeks; (3) intervention activity log, in which the problems encountered during the intervention and the participation status of patients, such as compliance were recorded; intervention activity logs have been proven to be sensitive tools for recording health actions [3].

2.3. Measurements

(1) The baseline indicators include demographic data, disease, treatment data from patients, and their medical records.

(2) Pittsburgh Sleep Quality Index (PSQI) [4] was used in this study to measure sleep quality. It has 7 subscales: sleep quality, sleep latency, the amount of sleep, sleep efficiency, sleep disorders, hypnotic drugs, and daytime dysfunction. There are 23 items, and each item is graded by 4 levels (0-3 points), with an overall score of 0-21 points. The higher the total score, the worse the sleep quality.
(3) The intensity subscale of the revised Piper Fatigue Scale [5] was used in this study to evaluate the intensity of fatigue. There are 23 items, and the severity of fatigue is classified as follows: 0 indicates none, 1-3 indicates mild, 4-6 indicates moderate, and 7-10 indicates severe. The scale has good reliability and validity, and the correlation between each dimension and total fatigue scale was above 0.85.
(4) The Chinese version of State-Trait Anxiety Inventory (STAI) [6] was used in this study to assess anxiety. There are 20 entries, options, and assignments: 1 = never; 2 = sometimes; 3 = often; 4 = almost always. The higher the score, the higher the trait anxiety. The internal consistency coefficient was 0.90.
(5) The functional status of the patients was investigated using the Chinese version of the SF-36 Health Questionnaire [7]. It includes four dimensions: physiological function, physical role, psychological function, and social function. SF-36 is an effective tool for evaluating psychoeducational intervention.
(6) At the end of each time point after intervention, the number of rehospitalizations for CHD recurrence were tracked and the (cumulative) rehospitalization rate of elderly patients with CHD was calculated.

2.4. Data collection and statistical analysis

Baseline measurements were taken one week before intervention (T0), and data were collected at the end of 1 month (T1), 3 months (T2), and 6 months (T3) after intervention.

SPSS 25.0 was used for statistical analysis, the symptom cluster score was expressed as $\bar{x}\pm s$, and repeated measures analysis of variance was used to test the effectiveness of the intervention. The (cumulative) rehospitalization rates of the two groups were compared using chi-square test (X^2).

3. Results

3.1. Symptom cluster scores of the two groups at each time point before and after intervention

The symptom cluster scores of the two groups at each time point before and after intervention are shown in **Table 1**.

Table 1. Symptom cluster scores of the two groups at each time point ($\bar{x}\pm s$)

Point-in-time	Group	Sleep	Fatigue	Anxiety	Functional status
T0	Intervention	9.81±3.86	3.80±2.64	42.83±10.89	50.34±22.15
	Control	9.88±3.71	4.26±2.87	43.24±10.59	49.91±22.08
T1	Intervention	8.06±2.86	3.51±2.91	42.13±11.52	51.67±30.21
	Control	9.16±3.76	4.89±2.97	43.62±11.76	46.93±30.55
T2	Intervention	6.80±2.11	3.19±2.62	39.25±10.24	57.51±27.69
	Control	8.39±2.95	4.98±2.99	44.54±11.95	44.17±30.44
T3	Intervention	5.56±1.25	3.29±2.79	39.81±10.36	56.35±31.45
	Control	7.78±2.26	3.97±2.82	40.65±11.29	53.49±33.05

3.2. Comparison of rehospitalization rates between the two groups after intervention

The comparison of rehospitalization rates between the two groups after intervention is shown in **Table 2**.

Table 2. Comparison of (cumulative) rehospitalization rates between the two groups at each time point after intervention [N (%)]

Group	T1	T2	T3	X^2	*P*
Intervention	1 (1.4)	2 (2.9)	8 (11.4)	10.685	0.001
Control	4 (5.7)	11 (15.7)	22 (31.4)		

3.3. One-way ANOVA of the effect of the intervention on elderly patients with CHD

The results in **Table 3** showed that the time and group interaction effects on sleep ($P = 0.002$), fatigue ($P = 0.011$), anxiety ($P = 0.001$), and functional status ($P = 0.000$) were significant.

Table 3. One-way ANOVA of the effect of the intervention on elderly patients with CHD

Source of variation	Sleep		Fatigue		Anxiety		Functional status	
	F	*P*	*F*	*P*	*F*	*P*	*F*	*P*
Time	5.845	0.004	0.051	0.944	0.076	0.906	1.175	0.312
Group	2.367	0.057	2.117	0.061	2.583	0.110	1.729	0.190
CHD classification	0.019	0.894	1.867	0.175	5.121	0.024	1.386	0.240
Time*Group	6.268	0.002	4.682	0.011	7.245	0.001	8.145	0.000
Time*CHD classification	1.161	0.315	0.107	0.890	0.028	0.958	0.220	0.801
Time*Group*CHD classification	0.668	0.510	1.056	0.346	0.458	0.608	0.009	0.990

3.4. Multivariate analysis of the effect of the intervention on elderly patients with CHD

The results in **Table 4** showed that the interaction between time and group was significant ($P = 0.003$). There was no significant interaction between time and CHD classification ($P = 0.863$), nor between time, group, and CHD classification ($P = 0.631$), indicating that the type of CHD does not affect the pattern of symptom cluster, and its classification does not affect the interaction between time and group.

Table 4. Multivariate ANOVA of the effect of the intervention on elderly patients with CHD

Source of variation	Wilks' lambda	*F*	*P*
Time	0.084	2.005	0.069
Group	0.083	3.065	0.058
CHD classification	0.045	2.093	0.105
Time*Group	0.138	3.484	0.003
Time*CHD classification	0.018	0.425	0.863
Time*Group*CHD classification	0.033	0.726	0.631

3.5. Patient compliance and participation in the intervention

The intervention logs showed that the patients have high level of attention and interest in the intervention. On average, PMRT was performed 4-5 times a week, and more than 60% of the patients read the manual and listened to the recordings.

4. Discussion

Sleep disturbance, fatigue, and anxiety are the main symptoms that plague older CHD patients, of which they often co-exist. Clinicians usually manage a symptom in isolation rather than as a cluster of symptoms.

Several studies have shown correlations and similarities between these symptoms, and as early as 1995, Lenz discussed the theory of the simultaneous influence of multiple symptoms, which laid the foundation for the study of symptom clusters. The strength of this study is that the three target symptoms were grouped into a composite result, a symptom cluster. If a dependent variable is explored separately, the overall difference in symptom intensity between the intervention group and the control group might have not been detected. Weinfurt believes that combined results are more sensitive than individual outcomes in detecting the effect of an intervention. In addition, the risk of Type I error was reduced when multiple comparisons were made in the same group of patients.

Another advantage lies in the use of three independent measurement tools to detect symptom intensity. Previous studies have used the composite symptom intensity score as a measurement result; hence, that the intervention effect of individual symptoms cannot be identified. Research has shown that psychological educational intervention can reduce the symptom burden of 12 common symptoms. In 2004, a similar study that demonstrated the positive effects of psychological education on 15 symptoms was carried out. However, these studies did not define multiple symptoms as clusters, neglecting the coexistence and correlation of symptoms. Psychological education is a feasible intervention that does not cause any harm to patients even in the late stages of disease development.

Given the generally poor health status of the subjects, it is necessary to use simpler measurement tools that will not burden the patients. Therefore, this study focused on symptom intensity, while other effects such as quality of life were not included.

This study proves that psychological education is an effective intervention that can alleviate the symptom cluster and improve the functional status of patients, but the long-term effect is still inconclusive. This study provides some references in the evaluation and management of sleep disturbance, fatigue, and anxiety as a symptom group, which should be included in the theoretical knowledge framework of symptom management for elderly patients with CHD. It is recommended to explore the theory, measurement, and management of symptom clusters in the future, especially the interconnected mechanisms and interventions of symptoms within a cluster.

Research has found that progressive muscle relaxation training can reduce fatigue and enhance muscle strength in elderly patients with CHD [5]. The reason may be that the training reduces the tension level of the body through the contraction and relaxation of the system as well as enhances the adjustment toward internal and external environmental stimuli, thereby reducing the stress level. The results of this study showed that, over time, psychological education combined with progressive muscle relaxation training can significantly change the symptom group; in addition, the intervention may affect patients' sleep, fatigue, anxiety, and functional status, resulting in a statistically significant difference in readmission rates between those who received the intervention and those who did not. It has a scientific significance (P = 0.001), which is consistent with the results of similar studies [8]. Therefore, attention should be paid to the research on symptom clusters. Large-scale clinical investigations should be conducted in the future to explore the relationship between symptoms and their specific clinical outcomes; understand patients' needs for symptom management, formulate symptom cluster intervention programs, and establish a symptom management model suitable for elderly patients with CHD, in order to provide reference and assistance for the long-term development of symptom management of CHD patients.

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Disclosure statement

The authors declare no conflict of interest.

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