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Review Article

Effects of multiple nursing on patients with coronary heart disease undergoing percutaneous coronary intervention

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Abstract: The effects of multiple nursing interventions on compliance behavior, cardiovascular adverse events, and nursing satisfaction of patients with coronary heart disease (CHD) receiving percutaneous coronary intervention (PCI) were studied. From February 2017 to November 2018, 125 Patients with CHD treated by PCI in our hospital were collected, of which 69 patients were enrolled as the observation group for multiple nursing and the rest as the control group (con group) for routine nursing. The compliance and SF-36 scores of patients in the two groups were compared to evaluate their quality of life. The nursing satisfaction of patients in the two groups was compared, and the length of stay and cardiovascular adverse events in the two groups were also compared. The risk factors of postoperative cardiovascular adverse events were analyzed by multivariate logistic regression. The total compliance rate and total satisfaction of the observation group were both significantly higher than those of the con group (both $P < 0.05$). The total adverse cardiovascular events in the observation group were significantly less than those in the con group ($P < 0.05$). In addition, the mean SF-36 score of the observation group was significantly higher than that of the con group ($P < 0.05$), and the hospitalization time of the observation group was significantly shorter than that of the con group ($P < 0.05$). Multivariate logistic regression analysis revealed that hypertension, diabetes mellitus, high LVDD, and the number of coronary lesions were independent risk factors for cardiovascular adverse events. In conclusion, multiple nursing can effectively improve the compliance behavior and nursing satisfaction of patients with CHD treated by PCI, and it reduces the incidence of cardiovascular adverse events. In addition, hypertension, diabetes mellitus and LVDD were independent risk factors of cardiovascular adverse events.

Keywords: Nursing intervention, cervical cancer, quality of life, compliance

Introduction

Coronary heart disease (CHD) is caused by atherosclerosis of the coronary artery, which will lead to stenosis and occlusion of the coronary artery, resulting in myocardial ischemia and hypoxia in patients [1]. Its morbidity and mortality are very high, seriously affecting the quality of life and safety of many patients [2]. According to the statistics of the American Heart Association in 2016, there are 15.5 million patients with CHD over 20 years old in the United States. The prevalence rate increases with age, and about 370000 people die of CHD each year in the United States [3, 4]. However, with the development of medical technology and the improvement of treatment plan, the mortality of patients with CHD has been in a downward trend [5].

At present, the treatment methods for patients with CHD mainly include drug therapy, percutaneous coronary intervention (PCI) and coronary artery bypass grafting [6, 7]. PCI is widely used in patients with CHD, which can expand the narrow lumen and place stent in the lumen to prevent the restenosis of the expanded lumen. The number of PCI in China has been increasing in recent years. In 2014, the total number of PCI was about 500946 cases [8, 9]. However, PCI may also lead to some cardiovascular adverse events in patients after operation, which will seriously compromise the postoperative recovery and prognosis [10].

Patients' behavior and compliance are very important for postoperative recovery. Poor behavior will affect patients' therapeutic effect and postoperative improvement [11], so im-

Table 1. Clinical data of patients [n (%)]

Factor	Observation group (n = 69)	Con group (n = 56)	t/χ^2 value	*P* value
Age (years)	58.4±7.4	59.6±6.8	0.935	0.352
BMI (kg/m^2)	20.75±2.62	21.04±2.97	0.580	0.563
Course of disease (year)	4.5±1.3	4.7±1.4	0.826	0.410
Gender			0.360	0.549
male	42 (60.87)	37 (66.07)		
female	27 (39.13)	19 (33.93)		
Smoking history			0.163	0.686
Yes	13 (18.84)	9 (16.07)		
No	56 (81.16)	47 (83.93)		
History of alcoholism			0.081	0.776
Yes	11 (15.94)	10 (17.8)		
No	58 (84.06)	46 (82.14)		
Place of residence			0.291	0.590
City	54 (78.26)	46 (82.14)		
Rural	15 (21.74)	10 (17.86)		
Past medical history				
Hypertension	30 (43.48)	32 (57.14)	2.309	0.129
Diabetes	18 (26.09)	16 (17.86)	1.204	0.272
Hyperlipemia	10 (14.49)	9 (10.71)	0.395	0.530
LVDD (mm)	45.37±5.14	43.84±4.77	1.709	0.090
LVEF (%)	41.42±5.47	40.43±5.06	1.040	0.300
Cardiac troponin T (UG/L)	0.32±0.07	0.33±0.05	0.899	0.371
Total cholesterol (mmol/L)	4.68±0.87	4.54±0.91	0.876	0.383
Triglyceride (mmol/L)	1.62±0.32	1.57±0.28	0.918	0.360
Number of stents	2.77±1.30	2.73±1.36	0.168	0.867
Number of coronary lesions	2.1±0.8	2.0±0.9	0.657	0.512

Note: BMI: standard weight, LVDD: left ventricular diastolic dysfunction, LVEF: left ventricular ejection fraction.

proving patients' behavior is the key to postoperative recovery. Many patients are prone to psychological burden due to lack of understanding of the disease, and lack of understanding of the treatment scheme results in low compliance [12]. Good postoperative nursing can improve patients' cognition of their own diseases and treatment emotions, provide nursing services from a more diverse perspective, and correspondingly affect patients' compliance behavior, so as to improve patients' postoperative recovery [13].

Therefore, we hope to use multiple nursing interventions to observe the compliance behavior of patients with CHD undergoing PCI and the impact on cardiovascular adverse events and nursing satisfaction, with the goal of providing basis and new direction for nursing.

Materials and methods

Clinical data of patients

From February 2017 to November 2018, 125 patients with CHD treated by PCI were collected. A total of 69 patients were selected as the observation group for multiple care, including 42 male patients, and 27 female patients, with a mean age of 58.4 ± 7.4 years, and the rest 56 patients were selected as the control group (con group) for routine care, including 37 male patients, and 19 female patients, with an average age of 59.6 ± 6.8 years. This study was reviewed and approved by Ethics Committee of the First Affiliated Hospital of Xi'an Jiaotong University and was conducted according to the international guidelines of Helsinki Declaration. All patients were informed and signed informed consents.

Inclusion and exclusion criteria

Inclusion criteria: Patients confirmed with CHD by imaging, and received percutaneous coronary intervention in The First Affiliated Hospital of Xi'an Jiaotong University; patients with complete clinical data, and those who cooperated with the treatment and follow-up.

Exclusion criteria: Patients with congenital immune deficiency, severe infectious and inflammatory diseases; patients with other serious cardiovascular and cerebrovascular diseases; patients with malignant tumors, or mental diseases.

Nursing methods

The con group was given routine nursing: 1. Indicate drug use. 2. To put forward the suggestions of balanced diet and nutrition. 3. To popu-

Table 2. Compliance behavior of two groups [n (%)]

	Observation group (n = 69)	Con group (n = 56)	X^2 value	P
Full compliance	23 (33.33)	13 (23.21)	1.544	0.214
Basic compliance	38 (55.07)	27 (48.21)	0.583	0.445
Noncompliance	8 (11.59)	16 (28.57)	5.743	0.017
Total compliance	61 (88.41)	40 (71.43)		

Table 3. Nursing satisfaction of two groups [n (%)]

	Observation group (n = 69)	Con group (n = 56)	X^2 value	*P* value
Very satisfied	25 (36.23)	17 (30.36)	2.000	0.157
Satisfied	38 (55.07)	26 (46.43)	0.924	0.336
Dissatisfied	6 (8.70)	13 (23.21)	5.055	0.025
Total satisfaction	63 (91.30)	43 (76.79)		

larize health education on CHD and percutaneous coronary intervention. 4. Complete daily life care. 5. Provide the hospital phone number and make reminders for future consultation.

The observation group received multiple nursing: 1. Psychological nursing: pay more attention to the patients' psychological changes at ordinary times. When the patients have bad emotions such as anxiety, fear and tension, give timely guidance to the patients, publicize the past successful rehabilitation cases to improve the patients' confidence, communicate with the patients' families, help the patients together with their families, and if necessary, carry out intervention by a professional psychologist. 2. Explanation of disease knowledge: introduce the cause, treatment method, efficacy and prognosis of the disease to the patient according to the patient's situation, so that the patient can fully understand the disease, supervise the patient's medication situation to a certain extent, remind and record the medication situation and adverse reactions. 3. Diet intervention: it is suggested that patients should keep a scientific, balanced and nutritious diet, and at the same time, the diet should be light and easy to digest. 4. Rehabilitation training: after the patient's condition is relatively stable, encourage and guide the patient to take some rehabilitation exercise training according to his/her own situation.

Measure outcomes

Main outcome measures: The self-made Compliance Scale of The First Affiliated Hospital of Xi'an Jiaotong University was used to evaluate patients' compliance behavior during the nursing period. Total compliance = full compliance + basic compliance. The cardiovascular adverse events were compared between the two groups. Using self-designed nursing satisfaction questionnaire to evaluate nursing satisfaction, total satisfaction = very satisfied + satisfied. Multivariate logistic regression was applied for analysis on the risk factors of cardiovascular adverse events.

Secondary outcome measures: Clinical data of the two groups; SF-36 score of them to evaluate their quality of life; the efficacy on the two groups was compared. Treatment with complete remission of symptoms was regarded as markedly effective; treatment with partial remission of symptoms was regarded as effective, and treatment with no remission of symptoms was regarded as ineffective. The total effective rate = the number of patients with markedly effective treatment + the number of patients with effective treatment/the total number of patients × 100%; length of stay of the two groups.

Statistical analysis

In this study, SPSS20.0 (Chicago SPSS Co., Ltd.) medical statistical analysis software was used to conduct statistical analysis on the obtained data, and Graphpad prism 7 (San Diego Graphpad Software Co., Ltd.) was used to draw pictures of the collected data. For the usage rate of count data (%), the chi square test was used. The measurement data were expressed as the mean ± standard deviation (mean ± SD). All the measurement data were in normal distribution. The independent sample t test was used to compare the two groups, the t-test to express the measurement data, and the multivariate logistic regression test to analyze the postoperative cardiovascular adverse events. $P < 0.05$ implies a significant difference.

Result

Clinical data of patients

By comparing the clinical data of the two groups, we found that there was no remarkable

Table 4. Adverse cardiovascular events in two groups [n (%)]

	Observation group (n = 69)	Con group (n = 56)	χ^2 value	*P* value
Angina pectoris	3 (4.35)	5 (8.93)	1.083	0.298
Arrhythmia	4 (7.25)	6 (8.93)	1.016	0.314
Revascularization	0 (0.00)	2 (3.57)		0.199
Miocardial infarction	1 (1.45)	2 (3.57)	0.594	0.441
Heart failure	3 (4.35)	3 (5.36)	0.069	0.793
Total cardiovascular adverse events	11 (15.94)	18 (32.14)	4.554	0.033

Table 5. Efficacy on patients [n (%)]

	Observation group (n = 69)	Con group (n = 56)	χ^2 value	*P* value
Markedly effective	37 (53.62)	24 (42.86)	1.434	0.231
Effective	26 (37.68)	25 (44.64)	0.625	0.431
Ineffective	6 (8.70)	7 (12.50)	0.480	0.488
Total effective	63 (91.30)	49 (87.50)		

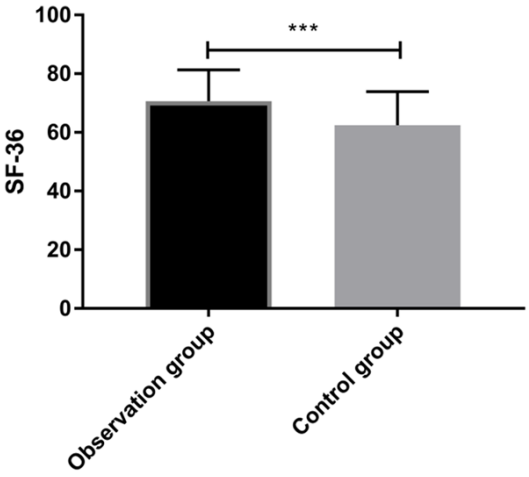

Figure 1. The SF-36 score of the two groups was significantly higher than that of the observation group (t = 4.138, P < 0.001), *** means P < 0.001.

difference between them in age, BMI, smoking history, drinking history, residence, tumor size, menopause, operation mode, FIGO stage, histopathological type, operation way, SCCA, CEA, and CA125 (P > 0.05), as shown in **Table 1**.

Comparison of compliance behaviors between the two groups

By comparing the compliance of patients in the two groups after nursing, it was found that there was no difference between them with regards to complete compliance and basic compliance (P > 0.05), and the total compliance rate in the observation group was significantly higher than that in the con group (P < 0.05), as shown in **Table 2**.

Comparison of nursing satisfaction between the two groups

By observing the nursing satisfaction of the two groups, we found that there was no difference between the two groups (P > 0.05), and the total nursing satisfaction of the observation group was significantly higher than that of the con group (P < 0.05), as shown in **Table 3**.

Cardiovascular adverse events in two groups

After observing the occurrence of cardiovascular adverse events in the two groups, it was found that there was no statistical difference between the two groups (P > 0.05) in angina, arrhythmia, revascularization, myocardial infarction and heart failure. The total cardiovascular adverse events in the observation group were significantly lower than those in the con group (P < 0.05), as shown in **Table 4**.

Comparison of efficacy between the two groups

Comparison of efficacy between the two groups showed that there was no significant difference between the two groups in the number of patients with markedly effective treatment, effective treatment, and ineffective treatment (all *P* > 0.05). See **Table 5**.

SF-36 score of two groups

According to the SF-36 scores of the two groups, the patients' quality of life was evaluated. It was found that the average score of SF-36 in the observation group was significantly higher than that in the con group (70.64 ±

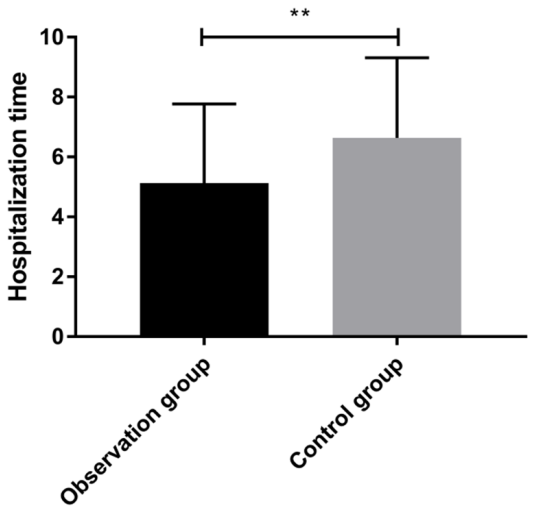

Figure 2. The length of stay in the two groups (the length of stay in the observation group was significantly higher than that in the con group) (t = 3.164, P = 0.002), ** indicates P < 0.01.

10.67 vs. 62.43 ± 11.46) (P < 0.05). See **Figure 1**.

Length of stay in two groups

Comparing the hospitalization time of the two groups, it turned out that the hospitalization time of the observation group was significantly lower than that of the con group (5.13 ± 2.64 days vs. 6.64 ± 2.67 days) (P < 0.05), **Figure 2**.

Single factor analysis of postoperative cardiovascular adverse events

There were 29 patients with cardiovascular adverse events in the two groups. We divided them into two groups according to the occurrence of cardiovascular adverse events. The clinical data of the two groups were acquired and analyzed. It was found that BMI, course of disease, gender, smoking history, history of alcohol abuse, residence, hyperlipidemia, cardiac troponin, total cholesterol, triglyceride and stent number did not exist. In statistical difference (P > 0.05), there were differences in age, hypertension, diabetes, LVDD, LVEF, number of coronary lesions and nursing mode (P < 0.05). See **Table 6**.

Multivariate analysis of cardiovascular adverse events after PCI

We included the indexes with differences in univariate analysis into the assignment (the assignment table is shown in **Table 7**), and then selected forward: LR for multivariate logistic regression analysis. The results revealed that hypertension (or: 3.310, 95% CI: 1.120-11.799), diabetes (or: 2.248, 95% CI: 0.893-9.205), LVDD (or: 1.124, 95% CI: 1.033-1.177), number of coronary lesions (or: 5.391, 95% CI: 1.483-12.588) were independent risk factors for cardiovascular adverse events after PCI. As shown in **Table 8**.

Discussion

PCI is one of the main methods for the treatment of CHD, which can significantly alleviate the symptoms of CHD and reduce the mortality [14, 15]. However, the incidence of cardiovascular adverse events after PCI is relatively high. When adverse events occur, it will further compromise the quality of life of patients and lower the nursing satisfaction [16-18].

In this study, we first compared the two groups of patients' behavior, and acquired that the compliance of patients in the observation group was significantly higher than that in the con group, which indicates that compared with conventional nursing dressing, multiple nursing can improve the compliance of patients' behavior of asking doctors. The low compliance of patients' behavior of asking doctors is mainly due to the patients' ignorance of the treatment methods and therapeutic effects and their fear of their own diseases. Therefore, we specially explained psychological nursing and disease knowledge in view of these situations, so that patients could fully understand the matching. The combination therapy can be well recovered and encouraged with their families. In the study of Viana et al. [19], it is mentioned that psychological intervention can help diabetic patients to comply with treatment. In this study, psychological intervention was also added to improve the nursing effect. After that, we also compared the nursing satisfaction of the two groups, finding that the nursing satisfaction of the observation group was significantly higher than that of the con group. Then we compared the length of stay in the two groups, finding that the length of stay in the observation group was significantly lower than that in the con group. Many patients undergoing PCI will think that CHD is no longer a problem they need to pay attention to after the treatment of sexual PCI, which also leads to

Table 6. Single factor analysis [n (%)]

Factor	Cardiovascular adverse group (n = 29)	Con group (n = 96)	t/χ^2 value	*P* value
Age (years)	61.9±6.1	57.7±6.9	2.947	0.004
BMI (kg/m^2)	21.01±2.55	20.84±2.82	0.291	0.772
Course of disease (year)	4.8±1.2	4.5±1.3	1.108	0.270
Gender			0.540	0.463
male	20 (68.97)	59 (61.46)		
female	9 (31.03)	37 (38.54)		
Smoking history			2.597	0.107
Yes	8 (27.59)	14 (14.58)		
No	21 (72.41)	82 (85.42)		
History of alcoholism			1.455	0.228
Yes	7 (24.14)	14 (14.58)		
No	22 (75.86)	82 (85.42)		
Place of residence			0.404	0.525
City	22 (75.86)	78 (81.25)		
Rural	7 (24.14)	18 (18.75)		
Past medical history				
Hypertension	21 (72.41)	41 (42.71)	7.862	0.005
Diabetes	13 (44.83)	21 (21.88)	5.925	0.015
Hyperlipemia	7 (24.14)	12 (12.50)	2.340	0.126
LVDD (mm)	47.91±4.63	43.71±4.86	4.122	< 0.001
LVEF (%)	35.75±4.82	42.14±5.27	7.069	< 0.001
Cardiac troponin T (UG/L)	0.34±0.04	0.32±0.06	1.683	0.095
Total cholesterol (mmol/L)	4.67±0.82	4.60±0.87	0.385	0.701
Triglyceride (mmol/L)	1.66±0.22	1.58±0.30	1.330	0.186
Number of stents	2.90±1.24	2.71±1.32	0.689	0.492
Number of coronary lesions	2.6±0.5	1.9±0.8	5.974	< 0.001
Nursing mode			4.554	0.033
Multiple nursing	11 (37.93)	58 (60.42)		
Routine nursing care	18 (62.07)	38 (39.58)		

Table 7. Assignment table

Factor	assignment
Age	Data belongs to continuous variable analysis with original data
Hypertension	Yes = 1, no = 0
Diabetes	Yes = 1, no = 0
LVDD	Data belongs to continuous variable analysis with original data
LVEF	Data belongs to continuous variable analysis with original data
Number of coronary lesions	Data belongs to continuous variable analysis with original data
Nursing mode	Routine nursing = 1, multiple nursing = 0
Postoperative cardiovascular adverse events	Occurred = 1, not occurred = 0

their neglect of the learning of relevant disease knowledge [20]. Arantes et al. [21] conducted one-year relevant knowledge education for PCI patients, and found that the quality of life of these patients in the field of emotion has been improved, while the patients in routine care have not changed, which also shows the importance of relevant knowledge education for patients. We compared the quality of life of the two groups based on SF-36 score, finding that

Table 8. Multi factor analysis

Factor	B	S.E,	Wals	Sig.	Exp (B)	EXP (B) 95% C.I.	
						Lower limit	Upper limit
Hypertension	1.471	0.633	3.876	0.021	3.310	1.120	11.799
Diabetes	1.446	0.796	3.305	0.029	2.248	0.893	9.205
LVDD	0.072	0.019	13.858	0.000	1.124	1.033	1.177
Number of coronary lesions	1.685	0.658	6.549	0.01	5.391	1.483	12.588

the observation group experienced significantly better quality of life than the con group. This also shows that the effect of postoperative multiple nursing is significantly better than that of routine nursing, which is particularly important for patients' postoperative rehabilitation. Nursing measures can be taken from the aspects of patients' physiology, psychology, medication, daily diet, postoperative rehabilitation exercise, etc., to improve patients' compliance with medical advice behavior, relieve patients' psychological pressure, and reduce patients' hospitalization time. As a result, our nursing satisfaction was further improved. In the study of Li et al. [22], we compared the differences of balloon dilation time, hospitalization time, hospitalization cost, postoperative complications and patients' satisfaction with nursing between clinical nursing pathway and routine nursing. It is found that clinical nursing pathway is a more cost-effective nursing strategy compared with conventional nursing. It has fewer complications and shorter hospital stay, so it can improve the nursing satisfaction of patients. In our study, we can also lower the patient's hospitalization time and complications, reduce the patient's hospitalization expense, and reduce the patient's suffering from adverse reactions, so the patient's nursing satisfaction is higher.

At the same time, we also compared the occurrence of cardiovascular adverse events in the two groups, and it turned out that there was no remarkable difference in angina, arrhythmia, revascularization, myocardial infarction and heart failure between the two groups. However, the total incidence of cardiovascular adverse events in the observation group was significantly lower than that in the con group, which indicated that multiple nursing methods could strongly lower the incidence of cardiovascular adverse events compared with conventional nursing. Finally, we further explore the risk factors of cardiovascular adverse events in patients with CHD after PCI. We found that hypertension, diabetes, high LVDD and the number of coronary lesions were independent risk factors of cardiovascular adverse events in patients with CHD by logistic regression analysis. In the study of Januszek et al. [23], it was mentioned that the incidence of perioperative complications in patients with chronic obstructive pulmonary disease (COPD) was higher. COPD was an independent risk factor without increased risk of reflow and perioperative allergic reaction. However, because there was no COPD in the samples included in this study, it was not explored.

However, there are some deficiencies in this study. First, the nursing mode in this study is mainly the nursing mode during the hospitalization period. Compared with some home nursing modes, our nursing time is limited. In addition, due to the development of the network, remote nursing guidance can also be carried out [24, 25]. It is unclear whether there will be different results in using these nursing modes. Second, the samples enrolled in this study were all patients, which did not include normal population for comparison. Finally, this study discussed the independent risk factors of postoperative cardiovascular adverse events, but did not explore the impact of a single adverse reaction. We hope to address these limitations in the follow-up study.

Conclusion

Multiple nursing can effectively improve the compliance behavior and nursing satisfaction of patients with CHD treated by PCI, and it can reduce the incidence of cardiovascular adverse events. Hypertension, diabetes and high LVDD are independent risk factors of cardiovascular adverse events.

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Disclosure of conflict of interest

None.

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