Original Article
Effects of clinical nursing pathways on postoperative rehabilitation and quality of life improvements in patients with coronary heart disease receiving coronary stenting

Xinjuan Wang

Department of Nursing, School of Medicine, Taizhou University, Taizhou, Zhejiang, China

Abstract: Objective: The aim of the current study was to examine the effects of clinical nursing pathways on postoperative rehabilitation and quality of life improvements in patients with coronary heart disease receiving coronary artery stenting. Methods: A total of 82 patients receiving coronary artery stenting were respectively analyzed. Of these, 40 patients receiving conventional nursing care were included in the control group, while 42 patients receiving clinical nursing care, in addition to conventional nursing care, were included in the observation group. Left ventricular ejection fraction, quality of life (SF-36), psychological status (SAS and SDS), postoperative complications, hospital stays, hospitalization expenses, and nursing satisfaction scores of the two groups of patients were compared. Results: The observation group exhibited significantly higher left ventricular ejection fraction and quality of life than the control group after nursing care (P<0.001). SAS and SDS scores in the observation group were significantly lower than those in the control group after nursing care (P<0.001). Incidence of postoperative arrhythmia and vagus reflex in the observation group was significantly lower than that in the control group (P<0.05). Hospital stays and hospitalization expenses in the observation group were significantly less than those in the control group. Total nursing satisfaction scores in the observation group were significantly higher than those of the control group (P<0.05). Conclusion: Clinical nursing pathways will improve clinical symptoms, quality of life, and the psychological status of patients receiving coronary artery stenting. Furthermore, it will reduce incidence of postoperative complications and adverse reactions, decrease hospital stays and hospitalization expenses, ease the economic and psychological burden on patients and family members, and upgrade nursing satisfaction scores. Therefore, it is worthy of extensive clinical promotion and application.

Keywords: Clinical nursing pathways, coronary heart disease, coronary artery stenting, quality of life

Introduction

Coronary heart disease (CHD) is the largest killer in developed countries. It is one of the largest disease burdens in developing countries. Three-fourths of CAD deaths in the world are found in low- and middle-income countries [1, 2]. Risk factors for coronary heart disease include smoking, hypertension, diabetes, hyperlipidemia, and obesity [3, 4]. However, studies have reported that CHD mortality in the EU has declined sharply in recent decades, achieved with the application of treatment and nursing care. Treatment and nursing care will improve first-level prevention and risk factor management, consequently decreasing incidence and mortality of the disease [5, 6].

Percutaneous coronary intervention (PCI) includes percutaneous transluminal coronary angioplasty and coronary stenting. Relatively safe and minimally invasive, PCI is the CHD therapy with the most significant efficacy, greatly improving clinical symptoms and quality of life of CHD patients [7, 8]. Scientific and effective nursing, along with positive and accurate clinical treatment, are keys to improving prognosis and increasing cure rates. The clinical nursing pathway (CNP) is an interdisciplinary, in-depth, comprehensive, and modern nursing model. The model gives priority to grading and classification before admission and general professional nursing protocols of hospital nursing, improving comprehensive nursing care service for patients [9]. CNP will effectively cut

Table 1. Comparison of general data [n (%)]

Factors	Observation group (n=42)	Control group (n=40)	t/χ²	P
Gender			0.764	0.507
Male	24 (57.14)	19 (47.50)		
Female	18 (42.86)	21 (52.50)		
Average age (years)	60.23±13.76	61.58±12.04	0.472	0.638
Course of disease (years)	6.17±2.65	5.24±3.02	1.484	0.142
Type of disease			1.718	0.424
Unstable angina pectoris	26 (61.90)	19 (47.50)		
Stable angina	10 (23.81)	13 (32.50)		
Old myocardial infarction	6 (14.29)	8 (20.00)		
NYHA Cardiac function classification			0.505	0.509
I	23 (54.76)	25 (62.50)		
II	19 (45.24)	15 (37.50)		
Diabetes			2.383	0.169
Yes	12 (28.57)	18 (45.00)		
No	30 (71.43)	22 (55.00)		
High blood pressure			1.717	0.267
Yes	16 (38.10)	21 (52.50)		
No	26 (61.90)	19 (47.50)		
Hyperlipidemia			1.344	0.270
Yes	22 (52.38)	26 (65.00)		
No	20 (47.62)	14 (35.00)		

down nursing management costs and significantly decrease wasting of hospital nursing resources [10].

This study aimed to examine the application of clinical nursing pathways in stent implantation for coronary artery disease, investigating its effects on postoperative rehabilitation and quality of life. The current study also aimed to provide data reference for clinical implementation and promotion of clinical nursing pathways.

Materials and methods

General data

Clinical data of 82 patients receiving coronary artery stenting for coronary artery disease were respectively analyzed. Of these, 42 patients receiving clinical nursing pathways based on conventional nursing care were included in the observation group. Inclusion criteria: All patients met clinical diagnostic criteria for coronary heart disease and all clinical data was complete. Exclusion criteria: Patients with malignant tumors, coagulopathy, liver and kidney dysfunction, mental illness, and language disorders. This study was approved by the School of Medicine of Taizhou University's Ethics Committee. Subjects and family members provided informed consent and voluntarily cooperated with the medical workers regarding diagnosis and treatment plans.

Nursing care methods

Patients in the control group received conventional nursing care. Before the operation, caregivers gave a brief introduction to the hospital and explained the treatment procedures of coronary angiography and stenting. They also explained postoperative precautions in simple and popular words, aiming to relieve as much
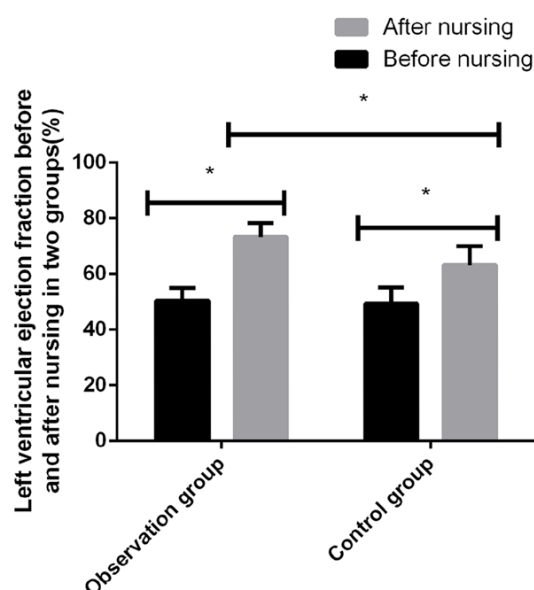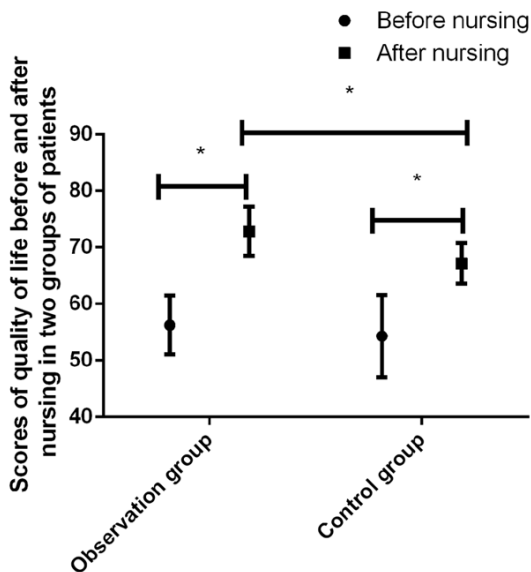

Figure 1. Left ventricular ejection fraction of the two groups of patients before and after nursing care in both groups. Results show that left ventricular ejection fraction, after nursing care, was significantly higher than that before nursing care in both the observation group and control group (P<0.001). Left ventricular ejection fraction of the observation group was significantly higher than that of the control group after nursing. Differences were statistically significant (P<0.001). *represents P<0.001.

Table 2. Left ventricular ejection fraction before and after nursing care in the two groups (%)

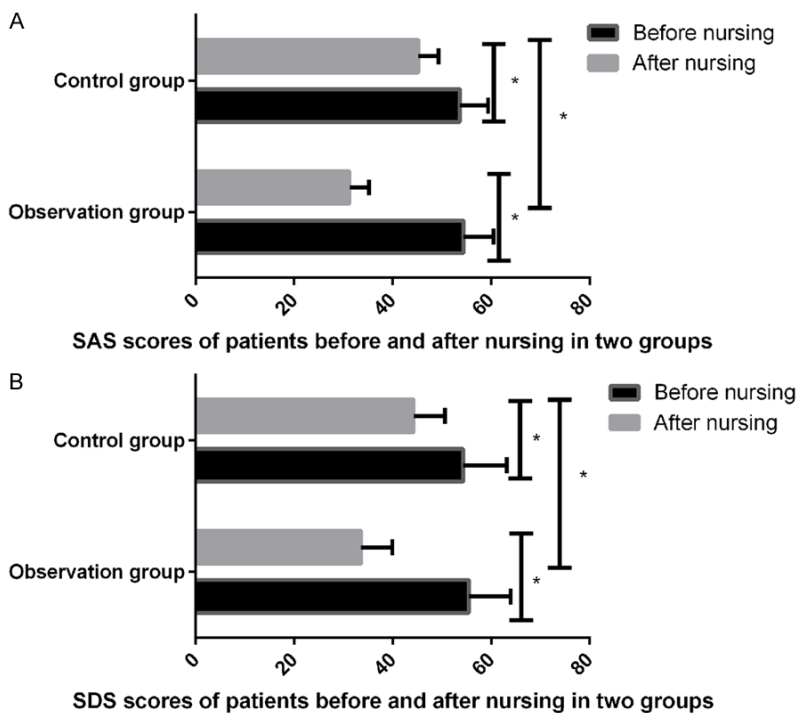| Group	n	Before nursing	After nursing	t	P
Observation group	42	50.35±4.62	73.27±5.14	21.490	<0.001
Control group	40	49.26±5.98	63.09±6.86	9.611	<0.001
t		0.926	7.629		
P		0.357	<0.001		

clinical nursing pathways before nursing. Nursing forms for both patients and medical workers were respectively established with nursing time as the lateral axis and nursing methods as the vertical axis. Nursing methods included admission guidance, activity rehabilitation plans, life schedule and policy, nursing objectives, diet instruction, health knowledge education, and other details and procedures. These helped patients and the medical workers implement standardized daily nursing care, recording details on the established forms. The forms were repeatedly revised and confirmed before eventually being applied, avoiding potential omissions.

At the time of admission to the hospital, the primary nurse actively introduced knowledge of coronary artery stenting to patients, ensuring that they recognized the necessity of surgery. Both the patients and their family members understood the medical process and treatment objectives during hospitalization. Introduction at admission helps to quickly create a good atmosphere for the patients and medical workers, prompting patients and their families to participate in nursing care actively. Minimizing negative emotions of the patients, nursing workers actively communicated with the patients and provided psychological counselling services. They also informed the patients of skills needed to cooperate during the operation. Clinical information of the patients was repeatedly checked. Examination results of electrocardiograms, urine routine, renal function, and coagulation function were reviewed to understand general conditions of the patients. Allergy histories of the patients were also be confirmed. Nursing workers helped patients cooperate with the doctor, ensuring a smooth examination and surgery. After the operation, nursing workers timely monitored the real time electrocardiogram and oxygen inhalation, reviewed regularly the conditions of bleeding and hematoma on the puncture site, checked the body temperature and blood pressure, and provided medicine regularly in accord with the advice of the doctors. Nursing providers repeatedly advised patients to eat light, digestible, and nutritious food and to drink more water. These are beneficial to the postoperative recovery of wounds and discharge of contrast agents. Post-

Figure 2. Results show that quality of life scores, after nursing care, were significantly higher than those before nursing care in both the observation group and control group (P<0.001). Quality of life scores of the observation group were significantly higher than those of the control group after nursing care. Differences were statistically significant (P<0.001). *represents P<0.001.

fear and anxiety of the patients as possible. During the examination and surgery, nursing providers helped patients find and maintain the correct body position, ensured that patients did not move during surgery, observed changes in vital signs during surgery, and reported any abnormalities to the physician, as well as taking appropriate measures immediately. Nursing workers urged the patients drink more water and keep a light diet after the operation. They prohibited patients from moving their upper limbs on the operation side within 1 hour after the operation, avoiding wound infections.

Patients in the observation group were given clinical nursing pathways in addition to conventional nursing care. All nursing workers received systematic training on items and methods of

Table 3. Quality of life scores before and after nursing care in the two groups of patients

Group	n	Before nursing	After nursing	t	P
Observation group	42	56.28±5.23	72.86±4.35	15.800	<0.001
Control group	40	54.31±7.27	67.14±3.58	10.010	<0.001
t		1.414	6.484		
P		0.161	<0.001		

Figure 3. The psychological status of the two groups of patients before and after nursing care. SAS and SDS scores, after nursing care, were significantly lower than those before nursing care in both the observation group and control group (P<0.001). SAS and SDS scores of the observation group were significantly lower than those of the control group after nursing care. Differences were statistically significant (P<0.001). *represents P<0.001

Table 4. Mental states of the two groups of patients before and after nursing care

Group	Time	Observation group (n=42)	Control group (n=40)	t	P
SAS	Before nursing	54.38±6.13	53.67±5.74	0.541	0.590
	After nursing	31.21±3.97	45.23±4.04	15.850	<0.001
	t	20.560	7.605		
	P	<0.001	<0.001		
SDS	Before nursing	55.43±8.52	54.31±8.91	0.582	0.562
	After nursing	35.58±6.37	44.25±6.34	6.175	<0.001
	t	12.090	5.818		
	P	<0.001	<0.001		

operative psychological counselling was given to the patients, relieving their mental stress.

Measurement outcomes

Primary outcomes: Left ventricular ejection fraction is a measurement to calculate the percentage of blood flowing out of these ventricles with each contraction and determined by an ecocardiogram. Quality of life scores, before and after nursing care, in both groups were compared. Quality of life scores of patients, before and after nursing care, were evaluated with the SF-36 scale from 8 perspectives. These included physical function, role function, pain of body, general health, state of vitality, social function, emotional function, and psychological health. Total scores of the SF-36 scale ranged from 1 to 100. Higher scores indicate a better health status [11].

Secondary outcomes: Self-rating anxiety scale scores (SAS), quantifying levels of anxiety for patients, and self-rating depression scale scores (SDS), measuring depression severity, were adopted to evaluate anxiety and depression levels of patients before and after nursing care. Anxiety: SAS scores ≥50; Depression: SDS scores ≥53. Higher scores indicate more serious anxiety and depression [12]. Incidence of postoperative complications, including arrhythmia, vagus reflex, hematomas, and heart failure, were compared between the two groups. Hospital stays and hospitalization expenses of the two groups of patients were compared. Questionnaires regarding nursing satisfaction were distributed to the patients before they were discharged from the

Table 5. Incidence of postoperative complications in the two groups [n (%)]

Group	n	Arrhythmia	Vagal reflex	Hematoma	Heart failure
Observation group	42	3 (7.14)	2 (4.76)	3 (7.14)	5 (11.90)
Control group	40	12 (30.00	8 (20.00)	7 (17.50)	9 (22.50)
χ^2		7.161	4.443	2.052	1.624
P		0.010	0.046	0.189	0.248

Statistical analysis

SPSS 19.0 (Shanghai Cabit Information Technology Co., Ltd.) was applied for statistical analysis. Count data are expressed as [n (%)] and rates were compared with χ^2 tests. Measurement data are expressed as x±SD and comparisons between the two groups were performed with t-tests. Paired t-tests were adopted for comparisons before and after nursing. P<0.05 implies statistically significant differences.

Results

Comparison of general data

Clinical data showed that gender, mean age, course of disease, types of disease, cardiac function classification, diabetes, hypertension, and hyperlipidemia of patients were not significantly different between the observation group and control group (P>0.05). The two groups were comparable (**Table 1**).

Clinical nursing pathway improves left ventricular ejection fraction

Left ventricular ejection fraction, before nursing care, was not significantly different between the observation group and control group (P>0.05). Left ventricular ejection fraction, after nursing care, was significantly higher than that before nursing care in both groups (P<0.001). Left ventricular ejection fraction (73.27±5.14) in the observation group was significantly higher than that in the control group (63.09±6.86) after nursing care. Differences were statistically significant (P<0.001) (**Figure 1** and **Table 2**).

Clinical nursing pathway improves quality of life

Quality of life scores, before nursing care, were not significantly different between the observation group and control group (P>0.05). Quality of life scores, after nursing care, were significantly higher than those before nursing care in both groups (P<0.001). The quality of life score in the observation group (72.86±4.35) was significantly higher than that in the control group (67.14±3.58) after nursing care. Differences were statistically significant (P<0.001) (**Figure 2** and **Table 3**).
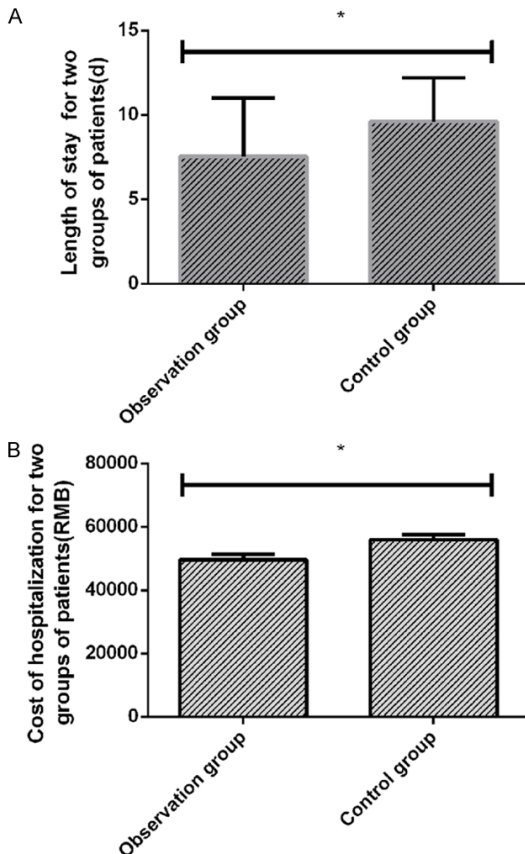
Figure 4. Hospital stays and hospitalization expenses of two groups of patients. Hospital stays of the observation group were significantly shorter than those of the control group and hospitalization expenses were significantly lower than those of the control group. Differences were statistically significant (P<0.05). *represents P<0.05.

hospital. Nursing satisfaction scores ranged from 0 to 100. Scores less than 70 suggest dissatisfaction, scores within 70-80 suggest general satisfaction, scores between 80-90 suggest satisfaction, and scores more than 90 suggest high satisfaction. The total nursing satisfaction rate = (total case number-case number with dissatisfaction)/total case number × 100%.

Table 6. Length of stay and cost of hospitalization for the two groups of patients

Group	n	Length of hospital stay (d)	Hospitalization expenses (RMB)
Observation group	42	7.53±3.47	49581.56±1637.53
Control group	40	9.61±2.58	55968.86±1534.25
t		3.068	18.210
P		0.003	<0.001

Clinical nursing pathway improves psychological status

SAS and SDS scores, before nursing care, were not significantly different between the observation group and control group (P>0.05). SAS and SDA scores, after nursing care, were significantly higher than those before nursing care in both groups (P<0.001). The observation group showed significantly higher SAS and SDS scores than the control group (P<0.001) (**Figure 3** and **Table 4**).

Clinical nursing pathway reduces postoperative complications

Incidence of postoperative arrhythmia and vagus reflex in the observation group was significantly lower than that in the control group and differences were statistically significant (P< 0.05). Incidence of postoperative hematomas and heart failure was not significantly different between the two groups of patients (P>0.05) (**Table 5**).

Clinical nursing pathway improves reduces hospital stays and expenses

Hospital stays of patients in the observation group [(7.53±3.47) d] were significantly shorter than those in the control group [(9.61±2.58) d]. Hospitalization expenses in the observation group [RMB (49581.56±1637.53)] were significantly lower than those in the control group [RMB (55968.86±1534.25)]. Differences were statistically significant (P<0.05) (**Figure 4** and **Table 6**).

Clinical nursing pathway improves nursing satisfaction

A total of 6 cases, 3 cases, 21 cases, and 12 cases were dissatisfied, generally satisfied, satisfied, and very satisfied with nursing care in the observation group, accounting for 14.29%,

7.14%, 50.00%, and 28.57%, respectively. A total of 14 cases, 7 cases, 16 cases, and 3 cases were dissatisfied, generally satisfied, satisfied, and very satisfied with nursing in the control group, accounting for 35.00%, 17.50%, 40.00%, and 7.50%, respectively. The total nursing satisfaction rate of the observation group was 85.71%, significantly higher than that of the control group (65.00%). Differences were statistically significant (P<0.05) (**Table 7**).

Discussion

PCI is an effective therapy for treatment of coronary heart disease, but the expenses are quite high. Hospital stays, which depend on the specific disease conditions of patients, increase the economic burden of patients and families. At the same time, patients receiving PCI may still suffer from various complications and adverse reactions [13]. In addition, patients may generate negative emotions due to insufficient knowledge regarding the surgery [14]. The three major complications of CHD are arrhythmia, heart failure, and cardiogenic shock, with arrhythmia as the most common complication [15]. Postoperative bleeding and hematomas in the site of puncture also have a higher incidence, while postoperative vagus reflexes may lead to hypotension or even induce shock [16, 17]. Therefore, a good nursing model and close monitoring by nursing providers regarding postoperative conditions of patients are of great importance to prognosis, adverse emotions, and quality of life improvements of patients.

As previous studies have reported, nursing providers always work too passively in conventional nursing care. In many cases, they do not provide high-quality and efficient nursing services to patients [18]. In addition, differences in occupational and educational backgrounds of patients will cause varieties of comprehension levels concerning knowledge in health education. As a result, health education in conventional nursing care can only be achieved by an explanation of basic surgical knowledge. Consequently, nursing care quality fails to be upgraded significantly [19]. In contrast, CNP emphasizes the "responsibilities" for specific patients throughout the whole nursing service via an individualized nursing mode [20, 21].

Table 7. Comparison of nursing satisfaction [n (%)]

Group	Not satisfied	Somewhat Satisfied	Satisfaction	Great satisfaction	Total satisfaction
Observation group (n=42)	6 (14.29)	3 (7.14)	21 (50.00)	12 (28.57)	36 (85.71)
Control group (n=40)	14 (35.00)	7 (17.50)	16 (40.00)	3 (7.50)	26 (65.00)
χ^2					4.767
P					0.040

Results of this study showed that left ventricular ejection fraction and quality of life scores of the observation group, after nursing, were significantly higher than those in the control group (P<0.001). This suggests that recovery of cardiac function in patients with coronary heart disease was better than that of the control group and that improvement in quality of life scores was also related to the recovery of cardiac function. Subsequent experimental results showed that CNP-treated patients had less complications, such as postoperative arrhythmia and vagus nerve reflex, which was beneficial to improving quality of life. Hospital stays and hospitalization expenses of the observation group were significantly less than those of the control group. Total nursing satisfaction scores of the observation group were significantly higher than those of the control group (P<0.05). Study results of Tamai and Wei were basically consistent with present results, suggesting that clinical pathway management was helpful in improving quality of life and nursing satisfaction, reducing adverse reactions, shortening hospital stays, and cutting down hospitalization expenses during the intervention therapy of liver cancer and PCI for coronary heart disease [22, 23]. The reasons may be that CNP is an individualized nursing protocol established by attending doctors, nurses, and head nurses with reference to domestic and overseas studies and specific conditions of the patients in each group. CNP includes daily service plans, procedures, and schedules, providing efficient, precise, and high-quality clinical nursing services to patients. Nursing supervision and evaluation are important aspects for implementation of nursing pathways. Evaluation of nursing processes and nursing effects performed by the head nurse will greatly promote the quality of nursing care [24-27]. This personalized care considers the specific conditions of each patient and develops a nursing system with reference to relevant studies, worldwide. It has a comprehensive supervision system to strengthen the monitoring of each patient. It is beneficial to the timely detection and treatment of postoperative adverse reactions. These factors are beneficial to the recovery of postoperative cardiac function.

SAS and SDS scores of the observation group were significantly lower than those of the control group after nursing care (P<0.001). The study of Gasior showed that CNP could improve the quality of comprehensive nursing care and alleviate anxiety and depression of patients [28]. This is because one nurse is responsible for providing nursing service to the specific patient during the whole hospitalization. Therefore, the senses of responsibility and urgency of the nurse are significantly promoted, the conditions of the patients are recognized in detail, and appropriate measures are taken immediately once the conditions of the patients change, securing the lives patients timely [29]. However, there were some shortcomings to the current study. This study only evaluated the short-term recovery of patients and did not conduct long-term follow-ups and investigations.

In summary, clinical nursing pathway mode will improve clinical symptoms, quality of life scores, and the psychological status of patients receiving coronary stenting. This method will also reduce incidence of postoperative complications and adverse reactions, cut down hospital stays and hospitalization costs, decrease the economic and psychological burden on patients and their family members, and upgrade nursing satisfaction scores. Thus, it is worthy of clinical application and promotion.

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Disclosure of conflict of interest

None.

Address correspondence to: Xinjuan Wang, Department of Nursing, School of Medicine, Taizhou Uni-

versity, 1139 Shifu Avenue, Jiaojiang District, Taizhou 318000, Zhejiang, China. Tel: +86-0576-886-65198; E-mail: wangxinjuuan@sina.com

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