

Original Article

Effects of individualized nursing on the rehabilitation of patients with cardiovascular diseases after cardiac interventional therapy

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Received September 26, 2018; Accepted October 23, 2018; Epub May 15, 2019; Published May 30, 2019

Abstract: Objective: To study the effects of individualized nursing on rehabilitation of elderly patients with cardiovascular diseases (CVD) after cardiac interventional therapy. Methods: A total of 400 elderly patients that underwent CVD intervention were selected for this study, and were randomly divided into either the individualized nursing group (intervention group, n=200) or the traditional cardiovascular medicine nursing group (control group, n=200). The ratio of males to females in each group was 1:1. Postoperatively, follow-ups were performed to observe and compare the effects of different nursing treatments after interventional therapy. Assessed indicators included the Self-rating anxiety scale (SAS) at 1 day, 3, and 6 months after surgery, the Pittsburgh sleep quality index (PSQI) at 1 day and 1 month after surgery, quality of life scores, and patient satisfaction. Results: There were no significant differences between the control group and the intervention group with regard to general patient demographics (such as gender, age, type of interventional surgery, and the number of patients with hypertension, diabetes, or hyperlipidemia) (all $P>0.05$). In the intervention group, the SAS scores at 1 day, 3, and 6 months after surgery and the PSQI scores on the 1st day and 1 month after surgery were significantly lower than those in the control group (both $P<0.05$); the quality of life score was significantly higher than that of the control group ($P<0.05$); and the patient's satisfaction with the nursing staff was much higher than that of the control group ($P<0.05$). Conclusion: Individualized nursing is more conducive to rehabilitation of elderly patients with CVD intervention, as it reduces patients' anxiety, and improves their sleep quality and quality of life. It is a feasible intervention.

Keywords: Individualized nursing, cardiac interventional therapy, elderly, anxiety, sleep

Introduction

Cardiovascular disease (CVD) is a general term for heart diseases, including rheumatic heart disease, congenital heart disease, hypertensive heart disease, coronary heart disease, myocarditis and other heart diseases [1]. In developed countries, the incidence and mortality of heart disease among the elderly is very high, while in developing countries the incidence and mortality of CVD among the elderly are increasing with economic progress. The incidence rate of CVD in China is reportedly 26% of other systemic diseases affecting elderly patients, so CVD is a frequent research subject [2, 3]. At present, the main therapeutic goals for treating CVD in the elderly include: (1)

to prevent acute infarction of cardiovascular and cerebrovascular tissues and to reduce associated mortality; and (2) to reduce blood pressure, control blood lipids, increase resistance to myocardial ischemia, and improve quality of life. Current treatment methods primarily include both pharmaceutical therapy and non-pharmaceutical methods such as vascular reconstruction [4, 5].

In recent years, a new diagnostic and therapeutic technique targeting CVD known as interventional therapy has been adopted. This is a method of diagnosing and treating CVD via the X-ray-guided puncture of blood vessels on the body surface, allowing for the delivery of catheters to a given lesion. This approach include

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coronary angiography, percutaneous transluminal coronary angioplasty + stenting, mitral balloon dilatation, radiofrequency ablation, and pacemaker implantation [6, 7].

However, as a traumatic operation, interventional therapy is associated with substantial risk. Such therapy will inevitably cause psychological and physiological impacts on patients, engendering a variety of negative emotions and prognoses [8, 9]. Therefore, this study analyzed the clinical effects of individualized nursing interventions on cardiac interventional therapy outcomes in elderly patients with CVD.

Materials and methods

Case data and grouping

A total of 400 elderly patients who underwent their first coronary artery intervention, cardiac radiofrequency ablation, or pacemaker implantation in The Affiliated Hospital of Ji'ning Medical University from January 2012 to January 2018 were selected for study inclusion. They were randomly divided into an individualized nursing group (intervention group, n=200) and a traditional cardiovascular medicine nursing group (control group, n=200) using a random number table. The ratio of males to females in each group was 1:1. The average age of the control group was 58.2 ± 11.7 years, and that of the intervention group was 59.4 ± 10.9 years. The control group was treated by routine nursing methods, while the intervention group was treated by individualized nursing. All patients signed informed consent and this study was approved by the Ethics Committee of The Affiliated Hospital of Ji'ning Medical University.

Inclusion criteria

For study inclusion, patients had to meet the diagnostic criteria for hypertensive heart disease, coronary heart disease, sudden cardiac arrest, or severe arrhythmia. All patients undergoing percutaneous coronary intervention met the indications required by the 2016 *Guidelines for Percutaneous Coronary Interventions in China* [10]; cardiac radiofrequency ablation patients met the indications specified in the 2012 radiofrequency catheter ablation guidelines for rapid arrhythmia [11]; cardiac pacemaker implantation patients met the indications prescribed by the guidelines for the

treatment of abnormal cardiac rhythms issued by the American College of Cardiology, the American Heart Association, and the Heart Rhythm Society in 2018 [12].

Exclusion criteria

Patients were excluded from percutaneous coronary intervention if they met the contraindications prescribed in the 2016 *Guidelines for Percutaneous Coronary Interventions in China*; patients were excluded from cardiac radiofrequency ablation if they met the contraindications prescribed in the 2012 radiofrequency catheter ablation guidelines for tachyarrhythmia; patients were excluded from cardiac pacemaker implantation if they met the contraindications prescribed by the guidelines for the treatment of abnormal cardiac rhythms issued by the American College of Cardiology, the American Heart Association, and the Heart Rhythm Society in 2018. Patients were also excluded if they had severe liver, lung, and spleen failure; severe heart failure and infarction; serious organ damage; malignant tumors or severe mental impairment; if they were uncooperative or pregnant.

Nursing methods

The control group was subject to routine nursing methods: general health education before surgery, strict postoperative monitoring of patient's vital signs, instructing patients to take medicine according to doctor's advice, and simple life guidance and discharge follow-up.

Individualized nursing methods for the intervention group included: (1) preoperative personalized health education: the medical staff communicated with the patient and established a good relationship with the patient. The medical staff advised them regarding the surgical methods, goals, precautions, postoperative daily activities and training, and intraoperative problems and solutions that may be relevant to each patient's personal conditions. In addition, after assessing the patient's awareness of their disease, those with low cognitive awareness and negative emotions received professional and systematic explanations aiming at alleviating preoperative anxiety. (2) Intraoperative care: Changes in body temperature were closely monitored. If the body temperature was low, patients were given thermal insulation care using a hot-air blower. If the

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Table 1. Scale of Pittsburgh sleep quality index

| Item | Program | Scores | | | |
|------|--|---------------------------|-----------------------|----------------------|---------------------------------|
| | | 0 | 1 | 2 | 3 |
| 1 | During the past month, what time have you usually gone to bed at night? | | | | |
| 2 | During the past month, how long (in minutes) has it usually taken you to fall asleep each night? | ≤15 min | 16-30 min | 31-60 min | ≥60 min |
| 3 | During the past month, what time have you usually gotten up in the morning? | | | | |
| 4 | During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.) | | | | |
| 5 | During the past month, how often have you had trouble sleeping because you... | Not during the past month | Less than once a week | Once or twice a week | No less than three times a week |
| | a. Cannot get to sleep within 30 minutes | | | | |
| | b. Wake up in the middle of the night or early morning | | | | |
| | c. Have to get up to use the bathroom | | | | |
| | d. Cannot breathe comfortably | | | | |
| | e. Cough or snore loudly | | | | |
| | f. Feel too cold | | | | |
| | g. Feel too hot | | | | |
| | h. Have bad dreams | | | | |
| | i. Have pain | | | | |
| | j. Other reason(s), please describe: | | | | |
| 6 | During the past month, how do you think your sleeping quality? | Very good | Fairly good | Fairly bad | Very bad |
| 7 | During the past month, how often have you had medicine to hypnosis? | None | Less than once a week | Once or twice a week | No less than three times a week |
| 8 | During the past month, how often have you felt drowsy? | None | Less than once a week | Once or twice a week | No less than three times a week |
| 9 | During the past month, how often have you been deficient in energy? | None | Occasionally | Sometimes | Often |

Table 2. Scoring methods

| Component | Content | Scores | | | |
|------------------------|--------------------|-----------|-----------------------|-------------------------|---------------------------------|
| | | 0 | 1 | 2 | 3 |
| A. Sleep quality | Item 6 | Very good | Fairly good | Fairly bad | Very bad |
| B. Sleep latency | Item 2 and Item 5a | 0 score | 1-2 score (s) | 3-4 scores | 5-6 scores |
| C. Sleep time | Item 4 | >7 h | 6-7 h | 5-6h (containing 6 h) | <5 h |
| D. Sleep efficiency | Item 1, 3 and 4 | >85% | 75-85% | 65-75% (containing 75%) | <65% |
| E. Sleep disorder | Item 5b-5j | 0 score | 1-9 score (s) | 10-18 scores | 19-27 scores |
| F. Hypnotic | Item 7 | None | Less than once a week | Once or twice a week | No less than three times a week |
| G. Daytime dysfunction | Item 8 and 9 | 0 score | 1-2 score (s) | 3-4 scores | 5-6 scores |

Note: Sleep efficiency = Item 4 (sleep time)/(Item 3 (get-up time) - Item 1 (go-to-bed time)) *100.

body temperature was over 37.5°C, heating measures were discontinued. The infusion or rinsing liquid used during the operation was warmed in advance, and was kept close to the patient’s body temperature. The patient’s distal extremities were covered with quilts to maintain good circulation. (3) Postoperative complications management: After the patient finished the operation, they were reminded that they cannot perform strenuous exercise. Careful observation was made of the patient’s condition, focusing on factors such as whether girdles were too tight, whether there was any bleeding from the wound, and whether the body could move freely. For patients with swelling, nurses were able to utilize a 25% magnesium sulfate solution for local wet application to relieve pain. (4) Postoperative diet care: Immediately after surgery, a cotton swab was used to draw drinking water to moisten the patient’s mouth; a fluid diet was given at 6h after surgery, followed by a semi-liquid and then a general diet. (5) Psychological care: The communication between nurses and patients was strengthened, with one-to-one communication adopted. Medical staff listened to patients and encouraged them to express their own anxieties and problems. The medical staff conducted personalized psychological interventions according to each patient’s occupation, education level, social experience and related factors, with the goal of relieving the patient’s anxiety and establishing their confidence in the treatment.

Survey tool: self-rating anxiety scale (SAS)

This study used the established SAS compiled by the Chinese professor, Zung (1971). It is a clinical tool mainly used to analyze subjective patient symptoms. Adults with negative emotions were suitable for pre-examination to determine whether they had anxiety or depres-

sive tendencies. For patients with these tendencies, psychological counseling is needed. SAS uses 4-level scoring to assess the frequency of symptoms. The criteria are: “1” means no or very little time; “2” sometimes; “3” most of the time and “4” most or all of the time, with higher scores indicating more severe anxiety [13].

Pittsburgh sleep quality index (PSQI)

The PSQI was used to assess the quality of sleep during the patient’s previous month. The PSQI consists of 19 self-rating and 5 other-rating items. The 19th self-rating and 5 other-rating items were not included in the scoring. In this study, only 18 self-rating items (see the attached questionnaire) were introduced. These 18 items made up seven components, with each component being graded on a scale of 0-3. The cumulative score for each component was the total PSQI score, ranging from 0-21. The higher the score was, the worse the patient’s sleep quality was [14]. See **Tables 1** and **2**.

Quality of life

Patient quality of life was scored with reference to the Karnofsky (KPS) functional status. The lower the score was, the worse the patient’s quality of life was. KPS is primarily used for cancer patients to assess their tolerance to treatment. In this study, this score was used to evaluate the tolerance for interventional therapy of patients with CVD. The patients with KPS scores below 60 were generally considered to have low tolerance, and interventional therapy cannot be implemented to [15].

Patient satisfaction

Patient satisfaction was investigated via questionnaire survey. Responses totals indicated:

Table 3. Comparison of general information

| | Control group (n=200) | Intervention group (n=200) | t/ χ^2 value | P value |
|------------------------|-----------------------|----------------------------|-------------------|---------|
| Male/female | 100/100 | 100/100 | | |
| Age (year old) | 58.2±11.7 | 59.4±10.9 | -0.130 | 0.925 |
| Hypertension | 145 (72.5%) | 140 (70.0%) | 0.195 | 0.659 |
| Diabetes | 98 (49.0%) | 95 (47.5%) | 0.040 | 0.841 |
| Hyperlipidemia | 45 (22.5%) | 40 (20.0%) | 0.239 | 0.625 |
| Intervention type | | | 0.644 | 0.886 |
| PCI | 136 (68.0%) | 130 (65.0%) | | |
| PM | 39 (19.5%) | 45 (22.5%) | | |
| RFCA | 12 (6.0%) | 13 (6.5%) | | |
| No less than two types | 13 (6.5%) | 12 (6.0%) | | |

Note: PCI, percutaneous coronary intervention; PM, cardiac pacemaker; RFCA, radio frequency catheter ablation.

Table 4. Comparison of postoperative anxiety score

| | Control group (n=200) | Intervention group (n=200) | t value | P value |
|-----------------------------|---------------------------|----------------------------|---------|---------|
| Before surgery | 45.67±6.39 | 46.72±6.73 | 1.600 | 0.110 |
| The first day after surgery | 38.33±4.68 ^{###} | 31.05±3.89 ^{ΔΔΔ} | 16.918 | <0.001 |
| 3 months after surgery | 30.76±5.09 ^{###} | 27.56±3.58 ^{ΔΔΔ} | 7.272 | <0.001 |
| 6 months after surgery | 27.39±4.72 ^{###} | 26.02±4.51 ^{ΔΔΔ} | 2.968 | 0.003 |
| Δ1 d | 7.34±1.71 | 15.67±3.54 | 29.965 | <0.001 |
| Δ3 m | 14.89±2.43 | 19.16±3.46 | 14.282 | <0.001 |
| Δ6 m | 18.28±2.61 | 20.70±3.66 | 7.613 | <0.001 |

Note: Within the control group, compared with preoperative, ^{###}P<0.001; within the intervention group, compared with preoperative, ^{ΔΔΔ}P<0.001.

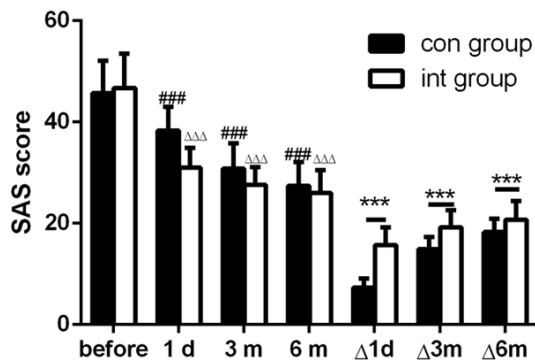


Figure 1. Comparison of postoperative anxiety. SAS, self-rating anxiety scale. Con group: control group; int group: intervention group. Before: pre-operation; 1 d: the first day after surgery; 3 m: 3 months after surgery; 6 m: 6 months after surgery; Δ1 d: Difference between the two groups on the first day; Δ3 m: Difference between the two groups in the third month; Δ6 m: Difference between the two groups in the sixth month. Comparison between groups, ^{***}P<0.001; within the control group, compared with preoperative, ^{###}P<0.001; within the intervention group, compared with preoperative, ^{ΔΔΔ}P<0.001.

very satisfactory: 90-100 points; satisfactory: 80-90 points; unsatisfactory: 80 points or less.

One day before discharge, all questionnaires were collected. The percentage of satisfaction = the number of (very satisfactory + satisfactory)/total number * 100%.

Research content

Primary observation indicators collected in this study included: telephone follow-up collection of anxiety scores on the first day, at 3 months, and 6 months after surgery; collection of follow-up Pittsburgh sleep quality scores on the first day and one month after surgery.

Secondary observation indicators included: general patient information, quality of life scores, and patient satisfaction with care.

Statistical methods

The obtained data were analyzed using SPSS 17.0. All counting data were expressed in number of cases/percent (n/%), and the comparison of counting data was performed using a chi-square test. All measurement data were expressed as mean ± standard deviation ($\bar{x} \pm SD$), and t-tests were used for between-group

Table 5. Comparison of PSQI

| | Control group (n=200) | Intervention group (n=200) | t value | P value |
|-----------------------------|---------------------------|----------------------------|---------|---------|
| Before surgery | 25.47±4.72 | 26.37±4.52 | 1.948 | 0.052 |
| The first day after surgery | 19.33±4.68 ^{###} | 18.05±3.89 ^{ΔΔΔ} | 2.975 | 0.003 |
| 1 months after surgery | 15.39±4.72 ^{###} | 12.02±4.51 ^{ΔΔΔ} | 7.300 | <0.001 |
| Δ1 d | 6.14±2.42 | 8.32±2.54 | 8.788 | <0.001 |
| Δ1 m | 10.08±2.45 | 14.35±2.45 | 17.429 | <0.001 |

Note: PSQI, Pittsburgh sleep quality index. Within the control group, compared with preoperative, ^{###}P<0.001; within the intervention group, compared with preoperative, ^{ΔΔΔ}P<0.001.

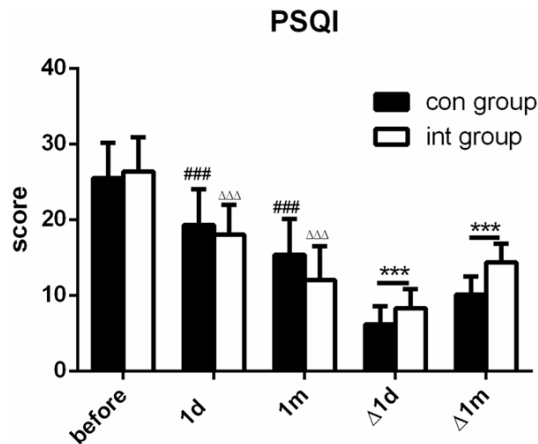


Figure 2. Comparison of PSQI. PSQI, Pittsburgh sleep quality index. Con group: control group; int group: intervention group. Before: pre-operation; 1 d: the first day after surgery; Δ1 d: Difference between the two groups on the first day; Δ1 m: Difference between the two groups in the first month. Comparison between groups, ^{***}P<0.001; within the control group, compared with preoperative, ^{###}P<0.001; within the intervention group, compared with preoperative, ^{ΔΔΔ}P<0.001.

comparisons. P<0.05 was considered to be statistically significant.

Results

General data comparison

There were no significant differences in gender ratio, age, incidence of underlying disease, or type of interventional therapy between the two groups (all P>0.05). See **Table 3**.

Comparison of postoperative anxiety

The anxiety of the intervention group was significantly lower than that of the control group on the first day, at 3 months, and 6 months after surgery. In the control group, the anxiety of patients on the first day, at 3 months and 6

months after surgery was also significantly lower than that before surgery. In the intervention group, the anxiety of patients on the first day, at 3 months, and 6 months after surgery was also significantly lower than that before surgery. See **Table 4** and **Figure 1**.

Comparison of PSQI

The PSQI scores of the intervention group were significantly lower than that of the control group on the first day, and 1 month after surgery. In the control group, the PSQI scores of the first day, and 1 month after surgery were significantly lower than that before surgery. In the intervention group, the PSQI scores of the first day, and 1 month after surgery were also significantly lower than that before surgery. See **Table 5** and **Figure 2**.

Comparison of KPS quality of life scores

The KPS quality of life scores on the first day, at 3 months and 6 months after surgery were significantly higher in the intervention group than in the control group. In both the control group and the intervention group, the KPS quality of life scores on the first day, at 3 months and 6 months after surgery were significantly higher than those before surgery. See **Table 6** and **Figure 3**.

Comparison of patient satisfaction

The postoperative satisfaction of the intervention group was significantly higher than that of the control group, and the difference was statistically significant. See **Table 7**.

Discussion

At present, the treatment of CVD is mainly based on interventional therapy [16]. The success of the surgery requires close cooperation

Table 6. Comparison of KPS quality of life scores

| | Control group (n=200) | Intervention group (n=200) | t value | P value |
|-----------------------------|---------------------------|----------------------------|---------|---------|
| Before surgery | 52.27±4.76 | 54.87±4.62 | 1.279 | 0.202 |
| The first day after surgery | 78.54±3.58 ^{###} | 80.22±3.22 ^{ΔΔΔ} | 4.934 | <0.001 |
| 3 months after surgery | 85.66±2.99 ^{###} | 86.53±2.58 ^{ΔΔΔ} | 3.115 | 0.002 |
| 6 months after surgery | 92.34±4.33 ^{###} | 93.44±4.03 ^{ΔΔΔ} | 2.630 | 0.009 |
| Δ1 d | 24.27±4.55 | 25.85±3.54 | 3.876 | 0.000 |
| Δ3 m | 31.39±4.22 | 32.16±3.56 | 1.972 | 0.049 |
| Δ6 m | 38.07±3.58 | 39.07±4.39 | 2.497 | 0.013 |

Note: KPS, Karnofsky. Within the control group, compared with preoperative, ^{###}P<0.001; within the intervention group, compared with preoperative, ^{ΔΔΔ}P<0.001.

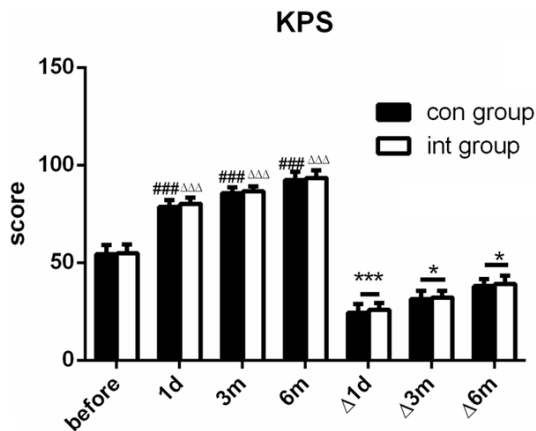


Figure 3. Comparison of KPS quality of life scores. KPS, Karnofsky Con group: control group; int group: intervention group. Before: pre-operation; 1 d: the first day after surgery; 3 m: 3 months after surgery; 6 m: 6 months after surgery; Δ1 d: Difference between the two groups on the first day; Δ3 m: Difference between the two groups in the third month; Δ6 m: Difference between the two groups in the sixth month. Comparison between groups, *P<0.05, ***P<0.001; within the control group, compared with preoperative, ^{###}P<0.001; within the intervention group, compared with preoperative, ^{ΔΔΔ}P<0.001.

between doctors and nurses, relying both on surgical skills and attentive nursing care. Lelakowski et al. found that after cardiovascular intervention, malignant arrhythmias can occur in the absence of proper care, potentially leading to death [17]. Individualized nursing after cardiac intervention has gradually developed with rapid development of cardiovascular interventional therapy over recent years. Individualized nursing interventions refer to the choice of targeted, personalized nursing according to individual needs [18]. This present study confirmed the effectiveness of individualized nursing. Individualized nursing can not only improve patients' anxiety, increase patients'

conscious cooperation, and enhance patients' confidence in operation; but also improve the post-operative recovery of patients, making individualized nursing an effective intervention strategy.

Cardiac interventional therapy, as a traumatic operation, can be a stressful event causing negative emotions including nervousness, panic, and anxiety. Xu et al. found that the negative emotions of patients undergoing cardiac interventional therapy are ubiquitous, and that certain interventions can alleviate these negative emotions and significantly improve prognosis of patients [19]. The results of this experiment showed that postoperative anxiety of patients treated via individualized nursing was significantly lower than that of those receiving conventional nursing care. This also indicates that adequate counseling and professional psychological counseling can better prevent occurrence and development of postoperative anxiety in patients. Our survey of postoperative patient satisfaction also demonstrates that individualized nursing can significantly improve patient satisfaction.

The PSQI rating scale is designed to assess sleep quality over the last month in patients with sleep disorders and mental disorders. Bellini et al. found that using the PSQI rating scale to evaluate patients with irritable bowel syndrome accompanied by significant sleep disorders can effectively reflect the reliability, validity and responsiveness of sleep quality [20]. This experiment used this scale to gain insight into sleep quality of patients with CVD after interventional therapy with individualized nursing. The PSQI score of the patients subject to individualized nursing was significantly lower than that of the control group on the 1 day and

Table 7. Comparison of postoperative satisfaction

| | Control group (n=200) | Intervention group (n=200) | χ^2 value | <i>P</i> value |
|-------------------|--------------------------|-------------------------------|-------------------|-------------------|
| Very satisfactory | 56 | 32 | 17.152 | 0.000 |
| Satisfactory | 104 | 144 | | |
| Unsatisfactory | 40 | 24 | | |

1 month after surgery. A possible explanation for this finding is that after individualized nursing care, patient anxiety is reduced, allowing patients to fall asleep more easily without awakening, thus markedly improving sleep quality.

About 6% of the patients experienced negative emotions before surgery. Excessive anxiety can lead to increased catecholamine and adrenocortical secretion. This can enhance susceptibility to infection, slow wound healing, and lead coagulation to exceed fibrinolytic mechanisms, leading to hypercoagulability and thereby exacerbating the occurrence of cardiovascular events, which in turn affects patient outcomes and prognosis after operation [21, 22].

Quality of life is a combination of physical, psychological, social, and other factors. The CVD interventions typically leave perioperative patients in a state of chronic stress, experiencing anxiety that exacerbates the occurrence of cardiovascular events. This study found that the quality of life scores improved significantly on the 1 day, 3 months, and 6 months after surgery if patients received individualized nursing. This is because individualized care improves patients' negative emotions, increases patients' confidence, relieves psychological stress, and increases the quality of life score.

This study has some limitations: the number of cases was small and the follow-up time was relatively short. It is possible that there is a significant difference in clinical effects between the two groups that would only be apparent upon long-term follow-up or with a larger sample size. In addition, as a random double-blind method was not used, a greater selection bias may have occurred, potentially affecting the reliability of these results.

In conclusion, individualized nursing intervention can reduce/anxiety of patients with CVD and reduce the incidence of postoperative

complications, greatly improving patient satisfaction.

Disclosure of conflict of interest

None.

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