Effects of modular nursing model for typical issues on enteral nutrition status, immune function, and quality of life in colon cancer patients

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ABSTRACT

Objective: This study aimed to analyze the effect of modular nursing model for typical issues on enteral nutrition status, immune function, and quality of life in patients with colon cancer.

Methods: The clinical data of 106 colorectal cancer patients who came to our hospital from January 2020 to January 2022 were retrospectively analyzed. The patients were randomized into the control and observation group based on the different nursing models, with 53 cases in each group. The patients in the control group received a simple enteral nutrition nursing model, while these in the observation group were administrated with a modular nursing model for typical issues on the basis of the control group. The differences in enteral nutrition status, immune function, and quality of life indicators of patients before and after nursing were counted and compared between the two groups.

Results: After the nursing, the contents of albumin, serum albumin, and transferrin were all elevated in both two groups compared with these before the nursing ($P < 0.001$), and these contents in observation group was markedly higher than these in the control group after the nursing ($P < 0.001$). The expressions of immune function indicators, including $CD3^+$, $CD4^+$, $CD4^+/CD8^+$, and SIgA of the two groups after the nursing, were much higher than these before the nursing ($P < 0.05$), while the contents of $CD8^+$ and IgG were sharply decreased in comparison with these before the nursing ($P < 0.05$). The improvement of immune indicators in the observation group after the nursing was strongly better than that in the control ($P < 0.01$). The proportion of the total nursing satisfaction was significantly higher in the observation group than that in the control ($P < 0.05$). After the nursing, the life quality scores of two groups were both strongly elevated ($P < 0.05$), and the improvement of life quality scores were memorably better in the observation group after nursing than these in the control ($P < 0.01$).

Conclusion: For patients undergoing radical colon cancer resection, modular nursing model for typical issues in the early postoperative period is not only safe, but also improves enteral nutrition, can better maintain immune function in the early postoperative period, improve nursing satisfaction, improve patient prognosis, and promote the improvement of the condition, which is worthy of popularization and application.

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1. Introduction

Colon cancer is a common malignant tumor of the digestive tract in clinical practice, which often occurs at the junction of the rectum and colon. After colon cancer, the patient's own physical function decreases. Under the progression of the disease, it will cause different degrees of invasion to multiple internal organs and tissues, causing serious damage to the patient's physical health. The symptoms of colon cancer are mostly abdominal pain, bloody stools, and weight loss. Due to the relative insidiousness of the early onset of the disease, most of the patients have entered the middle and advanced stages when they are admitted to the hospital, which not only makes the patients miss the best operation time, but also adversely affects the quality of life of patients [1,2].

Malnutrition is common in people with colon cancer. Prevalence varies depending on the patient's age, type of cancer, and stage of cancer. In malnourished patients, deficiencies or excesses of energy, protein, and other nutrients can adversely affect physical function and clinical outcomes. In addition, complications of severe malnutrition may increase chemotherapy toxicity, which in turn reduces physical function and survival, and decreases overall survival. Therefore, it is necessary to develop effective interventions to promote the nutritional intake of patients undergoing chemotherapy [3]. Colon cancer patients need to be treated with appropriate nursing interventions to help them recover their physical function. Modular nursing model for typical issues is a new type of nursing approach, that is, combined with previous clinical experience and literature research results, the typical problems that patients are prone to occur in nursing are analyzed, and modular treatment is implemented, and then modular nursing intervention countermeasures are formulated, so as to make the nursing plan more humane [4,5]. Relevant data showed that the modular nursing model for typical issues could effectively promote postoperative recovery of patients undergoing laparoscopic gastric cancer surgery, improve the prognosis and quality of life, and extend the survival period, which had significant advantages for patients [6]. However, there are currently few reports on the application of modular nursing interventions for typical issues on colon cancer patients.

In this study, 106 patients with colon cancer admitted in our hospital from January 2020 to January 2022 were picked as the study subjects, aiming to analyze the efficacy of modular nursing models for typical issues.

2. Materials and methods

2.1. Clinical materials

One hundred and six patients with colon cancer admitted in our hospital from January 2020 to January 2022 were picked as the study subjects. All patients were diagnosed with colon cancer and received the treatment. The clinical data were retrospectively analyzed and grouped by different nursing interventions, with 53 patients in each group. The observation group consisted of 33 males and 20 females, with the age ranging from 39 to 81 years old, and an average age of (60.00 ± 12.30) years. The tumor location included 15 cases in ascending colon, 15 cases in transverse colon, 20 cases in descending colon and 3 cases in sigmoid colon. The control group consisted of 23 males and 30 females, with the age ranging from 41 to 80 years old, and an average age of (59.50 ± 12.20) years. The tumor location included 12 cases in ascending colon, 14 cases in transverse colon, 17 cases in descending colon and 10 cases in sigmoid colon. There was no statistically significant difference in tumor location, age, gender, and other data of patients between the two groups ($P > 0.05$).

Inclusion criteria: (1) All patients met clinical diagnostic criteria for colon cancer [7]; (2) All the 106 patients received enteral nutrition support; (3) The patient was with the clear awareness and could communicate normally; (4) All patients were informed of this study, carefully read and signed the informed consent form. Exclusion criteria: (1) The patient underwent major surgery before participating in this study and their body was in a recovery period; (2) Patients with mental illness; (3) Patients with the dysfunction in essential organs, such as heart, liver and kidney; (4) Patients with a history of allergies; (5) Patients with incomplete information. The procedures have been approved by the ethics committee of our hospital.

2.2. Methods

The patients in the control group received a simple enteral nutrition care model. The detailed procedures were as follows: Within 20~24 h after treatment, enteral nutrition support operations needed to be initiated, with a concentration of 5 % nutrient solution. The drip rate of the nutrient solution was controlled within the range of 20~30 ml, and the dose was 200 ml–500ml per day. Glutamine was dissolved in normal saline, then added to the nutrient solution, and injected into the patient's body at the same time, twice a day. Caregivers needed to instruct the patient to urinate, inspect the wound for bleeding, and develop measures to prevent infection. At the same time, the nutritional status of the patient should be observed, and the risk screening NRS-2002 scale should be evaluated. Based on the patient's own health condition and patient medical history, the food tolerance was tested to carry out dietary guidance.

The patients in the observation group received modular nursing mode combined with typical issues based on the administration in the control group, and the specific operations were as follows: (1) The head nurse organized all the nursing staff of the department to take colon cancer patients as the nursing objects. Nurses needed to organize all nursing staff in the department to carry out nursing training and review the problems existing in nursing practice of patients with similar diseases in the past. Combined with the data analysis problems, including negative emotional problems, lack of knowledge problems, physical pain problems, and rehabilitation problems, the evidence-based nursing method was adopted, the scientific and reasonable nursing measures were consulted and screened for each nursing module, and the actual needs of patients and the actual nursing situation of our department were spliced and combined to form the following modular nursing strategy. (2) Psychological intervention module analysis (negative emotional problems). Communicate with patients cordially, accept the complex negative emotions caused by cancer itself and adverse effects of

radiotherapy (such as radiation esophagitis), and encourage patients to confide. Help patients accept the objective existence and inevitability of radiation esophagitis, guide patients to get rid of the concept of "why me (cancer/radiation reaction)", and face cancer and adverse reactions with a positive attitude. Invite successful colon cancer patients to the bedside to meet with caregivers face-to-face, explain the process of fighting adverse effects, exchange experiences and insights, or show a video presentation to the caregiver about past successful recovery experiences. Guide the patient's family and friends to provide emotional and nursing support in a timely and appropriate manner, and encourage the patient to seek active support from family and friends. (3) Analysis of health education intervention module (Lack of knowledge problem): During the nursing period, it was noteworthy to emphasize the importance of enteral nutrition and inform patients to receive treatment and intervention rationally; It was also necessary to explain the clinical symptoms of colon cancer disease, so that patients could face the disease with correct cognition, and gradually eliminate mis-understandings about treatment and nursing work when the condition worsens. In addition, it was meaningful to inform patients to maintain a good oral environment, clean regularly, and ensure sufficient water intake. (4) Pain problems in the body: For patients with cancer pain, dexamethasone should be used with caution and, if necessary, other types of analgesics, such as procaine 1 % solution. The depth and amount of drug inhalation were ensured through ultrasonic nebulization, slow deep breathing during nebulization, and abstinence from drinking within 30 min after nebulization. Closely observe the effects and adverse reactions of painkillers after use, and make targeted treatments; Suspension of radiation therapy should be considered in patients with severe pain. (5) Intervention analysis of continuous rehabilitation nursing module (Rehabilitation issues): After implementing corresponding treatment, patients' symptoms related to the disease would also be improved to a certain extent. However, some patients recovered slowly, and at this time, continuous rehabilitation care was needed. When leaving the hospital, special rehabilitation guidance forms were issued to patients, informing them to continue following the original dietary principles, develop correct dietary habits, and further strengthen self-monitoring work. Subsequently, regular follow-up visits would be conducted and follow-up procedures would be conducted to promptly identify and resolve issues, thereby enhancing the effectiveness of nursing interventions. (6) Summary of modular nursing intervention: Record this nursing method in written form and immediately carry out training for nursing staff in the hospital. Only
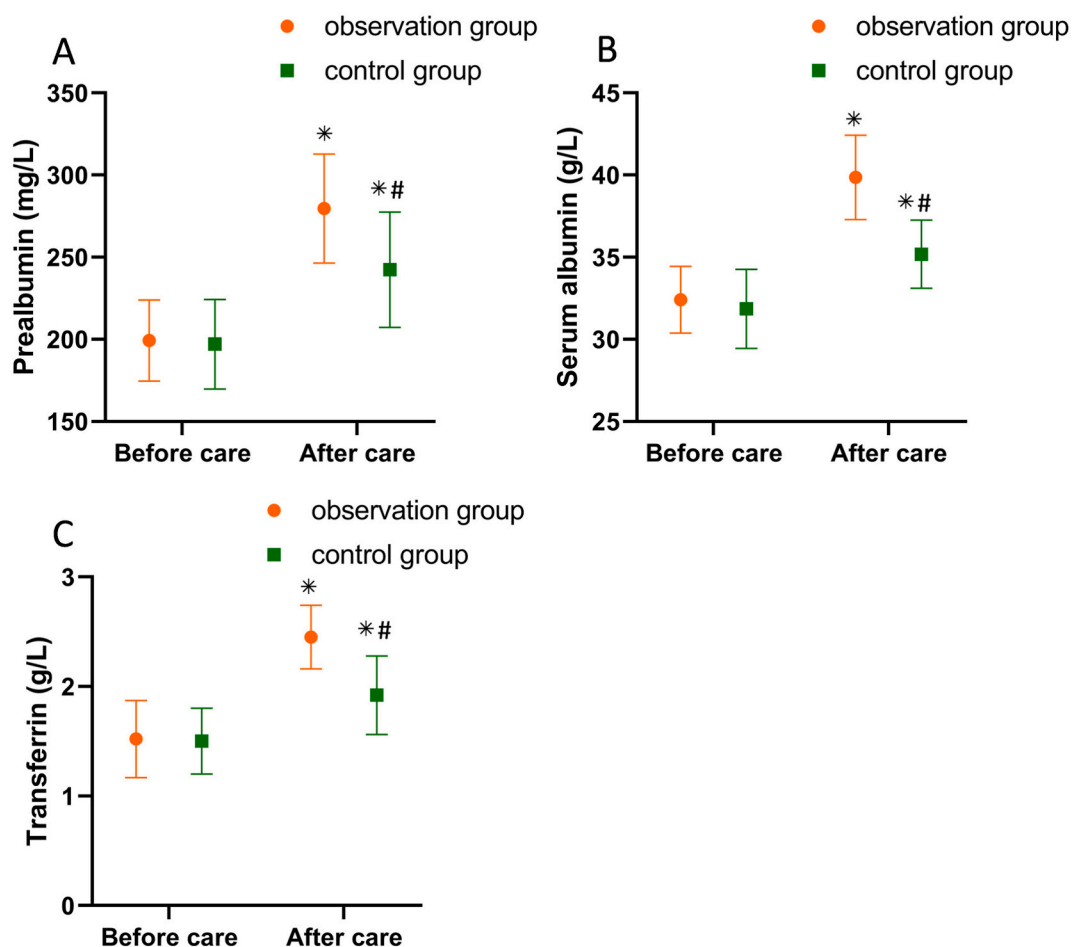

Fig. 1. Analysis of nutritional indicators of two groups.
A: Comparison of prealbumin levels; B: Comparison of albumin levels; C: Comparison of transferrin levels.
Note: *$P < 0.05$ compared with the same group before nursing, #$P < 0.05$ compared with the control group after nursing.

those who passed the training could take up the job, enhancing the value of nursing.

2.3. Outcome measures

(1) Nutritional indicators of the two groups before and after the nursing, including serum prealbumin, albumin, and transferrin were detected by immunoturbidimetry with the commercial kits. The commercial kits of prealbumin, albumin, and transferrin were bought from Shanghai Yudoe Biotechnology Co., Ltd., (Shanghai, China, catalog number: YDLC-16171), Wuhan Purity Biotechnology Co., Ltd., (Hubei, China, catalog number: CD-103910GM) and Shanghai Xinfan Biotechnology Co., Ltd., (Shanghai, China, catalog number: XFSW240B), respectively. Higher data indicated better nutritional status.
(2) Measurement of the immune function indicators: The levels of $CD3^+$, $CD4^+$, $CD8^+$, $CD4^+/CD8^+$ of the two groups before and after nursing were detected by flow cytometry with the commercial kits of from CUSABIO®, Wuhan Huamei Bioengineering Co., Ltd. (Hubei, China, catalog number: CSB-MA826490). Besides, the contents of SIgA and IgG were detected with the commercial kits of from Wuhan Boauite Biotechnology Co., Ltd. (Hubei Province, China) with the catalog number of OR549459 and orb564377, respectively.
(3) Patient satisfaction was evaluated using the hospital's self-made nursing satisfaction questionnaire, which included very satisfied (above 95 points), satisfied (75–95 points), and dissatisfied (below 75 points). Satisfaction percentage was calculated.
(4) Quality of life evaluation: 106 SF-36 scales were distributed and collected, and relevant data before and after nursing care were recorded. The indicators included physiological function, physical pain, social function, and emotional function, all on a percentage scale. The score was directly proportional to their quality of life.

2.4. Statistical analysis

Relevant research data in this study were input into the SPSS24.0 software, and all of them were conformed to the normal distribution statistics. The measurement data were expressed as mean ± standard deviation, and compared using t-test. The enumeration data were expressed as a percentage and compared using χ^2 test. $P < 0.05$ indicated the statistically significant difference.

3. Results

3.1. Analysis of nutritional indicators

Before nursing, there was no significant difference in the levels of prealbumin, serum albumin, and transferrin between the observation group and the control ($P > 0.05$, Fig. 1A–C). After nursing, the contents of albumin, serum albumin, and transferrin were all largely elevated in both two groups, and the contents in observation group were markedly higher ($P < 0.001$, Table 1 and Fig. 1A–C).

3.2. Immune function indicators

The immune function indicators were not statistically significant between the two groups before nursing ($P > 0.05$, Fig. 2A–F). After nursing, the contents of immune function indicators, including $CD3^+$, $CD4^+$, $CD4^+/CD8^+$, and SIgA of two groups were much higher than these before nursing, while the levels of $CD8^+$ and IgG were sharply decreased in comparison with these before nursing ($P < 0.05$, Fig. 2A–F). The improvement of immune indicators in the observation group after nursing was strongly better than that in the control group ($P < 0.01$, Table 2 and Fig. 2A–F).

3.3. Comparison of nursing satisfaction

The proportion of total nursing satisfaction was significantly higher in the observation group than that in the control group ($P < 0.05$, Table 3 and Fig. 3A and B).

Table 1
Analysis of nutritional indicators ($\overline{x} \pm s$).

| Nutritional indicators	Time	The observation group (n = 53)	The control group (n = 53)	t	P
Prealbumin (mg/L)	Before nursing	199.26 ± 24.60	197.03 ± 27.24	0.442	0.659
	After nursing	279.56 ± 33.13*	242.35 ± 35.05*	5.617	<0.001
Serum albumin (g/L)	Before nursing	32.41 ± 2.03	31.85 ± 2.41	1.294	0.199
	After nursing	39.86 ± 2.57*	35.18 ± 2.08*	10.305	<0.001
Transferrin (g/L)	Before nursing	1.52 ± 0.35	1.50 ± 0.30	0.316	0.753
	After nursing	2.45 ± 0.29*	1.92 ± 0.36*	8.347	<0.001

Note: *$P < 0.05$ compared with the same group before nursing.
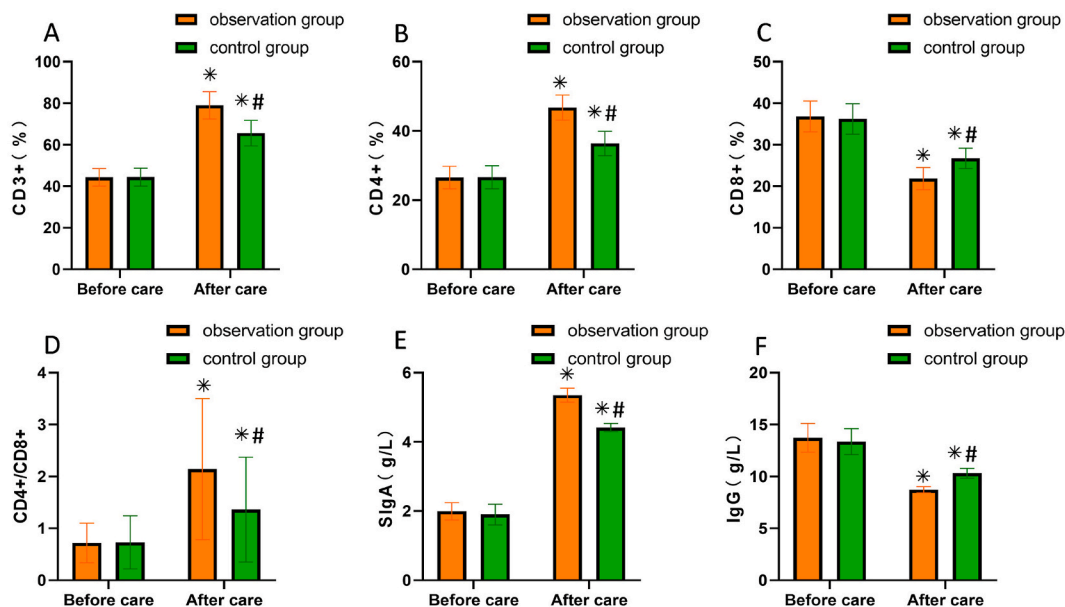
Fig. 2. Analysis of immune function indicators in patients.A: Comparison of CD3$^+$levels; B: Comparison of CD4$^+$levels; C: Comparison of CD8$^+$levels; D: Comparison of CD4$^+$/CD8$^+$ ratio; E: Comparison of SIgA levels; F: Comparison of IgG levels.Note: *$P < 0.05$ compared with the same group before nursing, $^\#P < 0.05$ compared with the control group after nursing.

Table 2
Immune function indicators ($\bar{x} \pm s$).

Immune function indicators	Time	The observation group (n = 53)	The control group (n = 53)	t	P
CD3$^+$ (%)	Before nursing	44.30 ± 4.21	44.42 ± 4.31	0.145	0.885
	After nursing	79.00 ± 6.51*	65.60 ± 6.18*	10.868	<0.001
CD4$^+$ (%)	Before nursing	26.50 ± 3.25	26.62 ± 3.34	0.375	0.709
	After nursing	46.75 ± 3.62*	36.39 ± 3.49*	14.910	<0.001
CD8$^+$ (%)	Before nursing	36.82 ± 3.71	36.22 ± 3.66	0.838	0.404
	After nursing	21.86 ± 2.66*	26.73 ± 2.45*	9.803	<0.001
CD4$^+$/CD8$^+$	Before nursing	0.72 ± 0.98	0.73 ± 0.91	0.054	0.957
	After nursing	2.14 ± 1.36*	1.36 ± 1.42*	2.888	0.005
SIgA (g/L)	Before nursing	1.99 ± 0.25	1.90 ± 0.30	1.678	0.096
	After nursing	5.35 ± 0.20*	4.41 ± 0.12*	29.340	<0.001
IgG (g/L)	Before nursing	13.72 ± 1.38	13.36 ± 1.25	1.408	0.162
	After nursing	8.72 ± 0.30*	10.30 ± 0.47*	20.629	<0.001

Note: *$P < 0.05$ compared with the same group before nursing.

3.4. Quality of life analysis

The life quality scores were not statistically significant between the two groups before nursing ($P > 0.05$). After nursing, the life quality scores of two groups were both strongly elevated ($P < 0.05$), and the improvement of life quality scores was memorably better in the observation group after nursing than that in the control group ($P < 0.01$, Table 4).

4. Discussion

Colon cancer occurs at a comparatively high incidence rate. The clinical treatment is mainly surgical resection and comprehensive

Table 3
Comparison of nursing satisfaction [n/%].

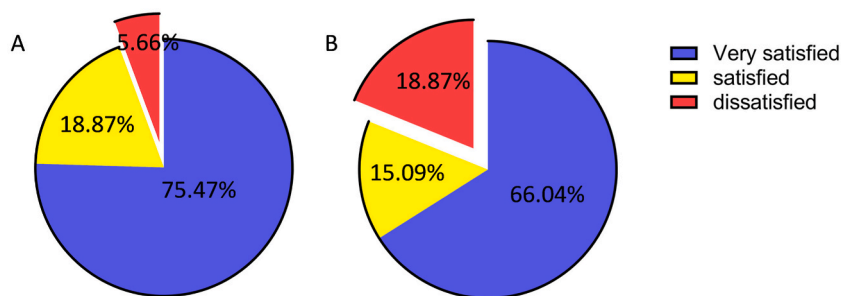| Group	Cases	Very satisfied	Satisfied	Dissatisfied	Satisfaction percentage
The observation group	53	40 (75.47)	10 (18.87)	3 (5.66)	50 (94.34)
The control group	53	35 (66.04)	8 (15.09)	10 (18.87)	43 (81.13)
χ^2		–	–	–	4.296
P		–	–	–	0.038

Fig. 3. Comparison of nursing satisfaction. A: The observation group; B: The control group.

Table 4
Quality of Life comparison ($\bar{x} \pm s$).

Indicators	Time	The observation group (n = 53)	The control group (n = 53)	t	P
Physiological function	Before nursing	59.00 ± 4.47	58.89 ± 4.50	0.671	1.063
	After nursing	76.89 ± 4.05*	74.15 ± 4.13*	3.192	0.001
Physical pain	Before nursing	71.16 ± 4.42	71.09 ± 4.50	0.945	1.062
	After nursing	78.93 ± 3.80*	70.93 ± 4.62*	8.384	<0.001
Social function	Before nursing	60.20 ± 4.62	59.92 ± 4.55	1.064	0.978
	After nursing	75.60 ± 4.90*	72.08 ± 4.33*	4.105	0.004
Emotional function	Before nursing	44.00 ± 5.51	43.99 ± 5.48	0.155	1.247
	After nursing	80.10 ± 5.21*	74.51 ± 4.50*	6.635	<0.001

Note: *$P < 0.05$ compared with the same group before nursing.

treatment, supplemented by radiotherapy. Although surgery has a positive therapeutic impact, postoperative patient care needs to be given careful consideration. Reaping the full benefits of surgical surgery requires quality postoperative care. Nonetheless, the majority of patients have weak immune systems and poor physical fitness. Additionally, patients' psychological burden is too great and they are unable to tolerate the effects of "cancer." This leads to an excess of "negative energy" that keeps patients from adhering to treatment guidelines, which significantly lowers the effectiveness of treatment and makes it more challenging [8,9]. As a result, it is crucial to provide patients with the appropriate nursing interventions throughout their course of therapy in order to help them regain their physical abilities and progressively regain their health, both of which will improve their prognosis.

The modular nursing model for typical issues, as a way to decompose complex systems into more convenient nursing methods, has been widely valued in clinical nursing work [10,11]. This model is primarily focused on the issues that arise in the nursing process in order to maximize the distribution of medical resources and encourage the enhancement of nursing quality. According to relevant data [12], applying the modular nursing model for typical issues to the nursing practice of patients with radiation esophagitis after radiotherapy for esophageal cancer can significantly reduce the severity of radiation esophagitis and the possibility of discontinuing treatment, while improve patient satisfaction. At present, a survey of preoperative nutritional status for colon cancer has found that, 50 % of patients experience weight loss before surgery, and about 20 % of patients have already malnutrition before surgery [13]. An effective dietary intervention can decrease surgical problems, shorten hospital stays, save costs, and increase patients' tolerance for surgery. Consequently, it is crucial to intervene in colon cancer patients' nutritional state. The study's findings demonstrated that, following nursing care, the observation group patients' immunological and nutritional function indicators had significantly improved in comparison to the control group. The nursing process, nursing measures, and nursing service scenarios and conditions are made more consistent, useful, and efficient by allowing nurses to actively engage in the development of nursing service plans and strategies through the use of the modular nursing model of typical issues. In order to ensure thorough and exacting nursing measures, the patients receive comprehensive modular nursing services that concentrate on different nursing difficulties related to colon cancer. It is shown that patients can take an active role in nursing care when standard concerns are addressed through modular nursing interventions. Patients' functional constitution, immune system, and nutritional status are all addressed by creating dietary programs that work. The aforementioned findings demonstrated that the modular nursing model was superior to the standard nursing approach in terms of patient nutritional indicators and immune function recovery, and it could provide colon cancer patients with greater care and efficacy for common difficulties. This nursing model focuses on solving the specific nursing population of enteral nutrition for colon cancer, and emphasizes the in-depth observation, analysis and confirmation of all nursing problems of such patients. On this basis, the typical nursing modules are carefully designed, and the corresponding effective nursing measures are actively sought and reasonably combined with each nursing module, thereby splicing a highly scientific and practical structured nursing plan. Nursing staff work according to this nursing plan, which is conducive to the clue sorting of each nursing item, clarifying the nursing goals pointed to by each nursing measure, always maintaining a clear nursing idea in the specific implementation process, and comprehensively considering the real-time, comprehensive and dynamic nursing needs of colon cancer and providing targeted satisfaction [14].

The term "quality of life" describes how people in various cultures and value systems experience their aspirations, expectations, and living circumstances in relation to the things that are important to them [15,16]. Incorporating quality of life into clinical efficacy

evaluation techniques for cancer patients has become essential. Furthermore, it is now common practice to assess postoperative patients' quality of life accurately in order to assess the treatment and rehabilitation outcomes for cancer patients who have undergone radical surgery. Patient satisfaction with treatment can be raised by promptly modifying treatment plans in light of feedback findings. The application of the modular nursing model for typical issues enables colon cancer patients to obtain high-quality special nursing services with strong indication of intervention goals, extensive and comprehensive intervention ideas, and scientific and practical intervention measures, so it is easy to obtain more ideal intervention effects. The study's findings also demonstrated that patients' post-nursing satisfaction and quality of life were significantly higher in the observation group than these in the control group. These findings suggest that modular nursing interventions for common problems could enhance overall nursing effectiveness, improve patient satisfaction, and gradually restore physical function. It is feasible to begin with nursing personnel actively listening to patients' stories, helping with diagnosis, and providing them with additional attention by using modular care for common problems. We may significantly raise the patient's quality of life and raise the standard of care overall by being sensitive to and understanding of their feelings. According to research, implementing a modular education model during the nursing process can significantly enhance patients' quality of life, reduce their risk of anxiety and depression, increase patient satisfaction, and guarantee successful recovery following surgery for thyroid cancer [17,18]. Based on modular nursing model for typical issues, breast cancer patients could effectively control the risk of complications and achieve high patient satisfaction during the perioperative phase, as several studies have demonstrated [19]. Researchers have discovered that a standard problem-based combined comprehensive nursing plan can accurately improve patients' quality of life and nursing satisfaction when it comes to postoperative care for patients with low rectal cancer undergoing anal preservation surgery [20]. The modular nursing model of typical issues allows nurses to fully participate in the formulation of nursing service strategies and programs, so that the nursing process, nursing measures and clinical nursing service scenarios and conditions are more compatible, more practical, more executive, and more effective, and it is easy to improve the sense of service value of nursing workers, thereby improving the nursing satisfaction of nurses. The deterioration of colon cancer was effectively curbed after receiving modular care for typical problems in the observation group, and the probability and degree of physical and mental discomfort of colon cancer patients were significantly reduced, and the proportion of treatment interruption decreased, so it was easy to give a higher effectiveness evaluation. In addition, patients received comprehensive modular nursing services focusing on various nursing problems of colon cancer, which ensured the comprehensiveness and meticulousness of nursing measures, so patients had a high evaluation of the comprehensiveness of nursing services. From the above research results, it can be seen that the nursing work of colon cancer patients during treatment is particularly important, and the modular care model can shorten the patient's hospital stay and reduce the use of medical resources.

In general, for patients undergoing radical colon cancer resection, modular nursing intervention for typical issues in the early postoperative period is not only safe, but also improves enteral nutrition, can better maintain immune function in the early postoperative period, improve nursing satisfaction, improve patient prognosis, and promote the improvement of the condition, which is worthy of popularization and application. However, the current research section is only a horizontal study with limited time and sample size. Longitudinal research can accurately reflect the changes in nutritional status and immune function of colon cancer patients during treatment, which has greater guiding significance for clinical nursing. Therefore, further longitudinal studies with multiple centers and large samples will be conducted in the future.

Ethics approval and consent to participate

This study was approved by The Ethics Committee of Henan Provincial People's Hospital (No. 2020-HNPP-013). Informed consent was obtained from participants for the participation in the study and all methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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CRediT authorship contribution statement

Fengxia Chen: Writing - original draft, Software, Conceptualization. **Yan Dou:** Software, Resources, Methodology. **Wei Wei:** Methodology. **Huan Duan:** Software. **Chunchun Liu:** Software.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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