

ORIGINAL RESEARCH

Effect of MDT-based nutritional management mode in perioperative nutritional management of gastric cancer patients

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Abstract

To investigate the effect of multidisciplinary team (MDT)-based nutritional management approach on the perioperative nutrition care of gastric cancer patients. A total of 120 patients who underwent radical gastrectomy for gastric cancer from November 2021 to October 2023 were retrospectively enrolled. The participants were divided into two groups: the control group (n = 60), comprising patients who underwent surgery from November 2021 to October 2022, and the observation group (n = 60), including patients who had their surgery from November 2022 to October 2023. While the control group received standard care, the observation group was administered an MDT-based nutritional management protocol in addition to the standard care. Perioperative nutritional status, postoperative gastrointestinal function parameters, gastrointestinal feeding intolerance and quality of life were compared between the two groups. Results indicated a marked improvement in the perioperative nutritional status, postoperative gastrointestinal function, and quality of life in the observation group compared to the control group ($p < 0.05$). Furthermore, the incidence rate of gastrointestinal feeding intolerance in the observation group was significantly lower than that in the control group, with the differences achieving statistical significance ($p < 0.05$). The findings suggest that the MDT nutrition management mode can improve the nutritional status of patients, promote the rehabilitation of gastrointestinal function and quality of life, and reduce the incidence of gastrointestinal feeding intolerance, which is worthy of promotion in clinical practice.

Keywords

MDT; Nutritional management mode; Gastric cancer patients; Perioperative period

1. Introduction

In recent years, epidemiological studies have elucidated that gastrointestinal cancers constitute a significant proportion of cancer-related fatalities. Among these, gastric cancer stands out as a highly prevalent and lethal malignancy, posing a grave threat to public health [1]. Statistical analyses from the World Health Organization's 2020 data showed that there were 479,000 new cases of gastric cancer and 374,000 cases of deaths in China [2]. Following radical gastrectomy, the average weight loss of patients is about 10% within the first month, and malnutrition has become one of the main complications of this surgery [3]. Radiation therapy targeting the digestive tract often results in malnutrition, which can exacerbate the risk of toxicity and compromise clinical outcomes, thereby affecting patients' quality of life and survival prognosis [4]. The nutritional status of patients in the preoperative phase is intrinsically linked to the surgical process and is crucial for both a successful surgery and postoperative recovery [5]. In

the case of poor preoperative nutritional status, the tolerance decreases and the incidence of intraoperative adverse events is also relatively high, so effective nutritional care measures are particularly important [6]. Meanwhile, due to the unique anatomical site of tumor is relatively special in patients with gastric cancer, and surgery serves as one of the effective methods for the treatment of gastric cancer, which seriously endangered the nutritional status of patients after surgery [7]. Multidisciplinary diagnosis and treatment (MDT) represents a patient-centered, interdisciplinary approach to interventions and treatment options for specific diseases [8]. Despite this, there remains a gap in the standardization of nutritional support nursing protocols within clinical settings [9]. The study aims to investigate the effect of MDT-based nutrition management model in perioperative nutrition management of gastric cancer patients, and the results of the study are summarized as follows.

2. Materials and methods

2.1 Study subjects

This study retrospectively enrolled 120 patients who underwent radical gastrectomy for gastric cancer at our institution from November 2021 to October 2023 as the study cohort. The participants were divided into two groups based on the timeline of their surgery. The control group comprised 60 patients who underwent radical gastrectomy from November 2021 to October 2022, while the observation group included 60 patients who had the procedure from November 2022 to October 2023, all of whom met the predefined inclusion and exclusion criteria. Inclusion criteria: ① Aged >18 years old; ② Pathologically diagnosed as gastric malignant tumor with no history of other malignancies; ③ Underwent radical gastrectomy. Exclusion criteria: ① Severe heart, lung, liver and kidney dysfunction; ② Allergic to or intolerance of enteral nutrition preparation; ③ Development of serious complications after radical gastrectomy; ④ Clinical deterioration or voluntary withdrawal from the study. The general data of patients in the two groups were comparable ($p > 0.05$), as shown in Table 1.

2.2 Study methods

2.2.1 Study methods for control group

① Nutritional assessment was performed weekly to assess the nutritional status of patients. ② Ongoing nutritional education was conducted, with the attending physician and nursing staff taking the lead in imparting disease-specific and nutrition-related knowledge. ③ Dietitians reviewed and adjusted the nutritional prescription on a weekly basis to guarantee that patients were receiving adequate and appropriate nutritional support. ④ Intake records and dietary supervision were performed to compare with the MDT nutrition management model

group. ⑤ The duration of intervention was 1 month to assess the effect in the short term.

2.2.2 Study methods for observation group

2.2.2.1 Formation of MDT team

The nutrition support team formed included nutrition specialist nurses, dietitians, gastroenterology surgeon, responsible nurses, charge nurses and psychological counselors. The specialized nutrition nurses were tasked with evaluating the nutritional status of patients and crafting individualized nutrition plans. Dietitians participated in team meetings, worked together to develop protocols, dynamically assessed patient nutritional status and conducted weekly group discussions to assess program outcomes and make recommendations for improvement. The team convened regularly to discuss cases, ensuring holistic nutritional care for patients and contributing to the formulation of perioperative dietary strategies. Gastroenterology surgeon was responsible for disease counseling, evaluation, physical examination, development of personalized diagnosis and treatment plans and tracking the whole course of treatment plans. Responsible nurses managed patient health records, nutritional monitoring, health education, follow-up care and data collection. Charge nurses were responsible for overall communication, organizing training, and regular assessment. Psychological counselors were responsible for psychological counseling and relieving patients' psychological anxiety and depression. All team members underwent uniform training in knowledge and skills, including how to accurately measure patients' nutritional indicators, body weight, nutritional risk screening, and dietary guidance. Through a combination of theoretical instruction and practical application, the team ensured that each member possessed the competencies necessary to effectively manage and apply nutrition care.

TABLE 1. General data (n, $\bar{x} \pm s$).

Group	Case	Control group	Observation group	$\chi^2/t/Z$	p
Age (yr)		47.70 \pm 6.30	47.15 \pm 5.39	0.514	0.608
Gender					
	Male	34 (56.70%)	35 (58.30%)	0.034	0.853
	Female	26 (43.30%)	25 (41.70%)		
TNM					
	Stage I	23 (38.30%)	19 (31.70%)	0.587	0.746
	Stage II	20 (33.30%)	22 (36.70%)		
	Stage III	17 (28.30%)	19 (31.70%)		
Tumor site					
	Antrum of stomach	18 (30.00%)	22 (36.70%)	0.645	0.724
	Body of stomach	20 (33.30%)	19 (31.70%)		
	Fundus of stomach	22 (36.70%)	19 (31.70%)		
Surgical method					
	Proximal resection	19 (31.70%)	22 (36.70%)	0.439	0.803
	Distal resection	22 (36.70%)	19 (31.70%)		
	Total gastrectomy	19 (31.70%)	19 (31.70%)		

TNM: Tumor Node Metastasis.

2.2.2.2 Development of nutritional management programs

A comprehensive nutritional management intervention program was meticulously crafted. Upon admission, a nutrition specialist nurse conducted a thorough nutritional evaluation to gain a comprehensive understanding of the patient's nutritional status. Concurrently, through dynamic nutritional monitoring, Body Mass Index (BMI), blood routine and laboratory parameters were applied to regularly assess and monitor the nutritional status of patients, and timely measures were taken to intervene in patients with malnutrition. Patients in both groups were managed in accordance with the nutritional support guidelines for cancer patients established by the China Anti-Cancer Association, following the "total parenteral nutrition (TPN)" and the "partial parenteral nutrition (PPN)" in conjunction with enteral nutrition. Enteral nutrition is recommended according to the patient's condition and gradually increased, and partial or total parenteral nutrition is combined in time when the patient is unable to obtain adequate nutritional requirements via the enteral route or special circumstances arise. The recommended target caloric intake was set at 25–30 kcal/kg/d.

2.2.2.3 Measures for nutritional support

① The observation group was given MDT nutrition management throughout the disease trajectory: Establishing health records: The responsible nurse established personal health records for the patients, documenting the general data, nutritional biochemical indicators, anthropometric indicators, Patient-Generated Subjective Nutrition Assessment (PG-SGA) score. Health education sheets were distributed, which outlined key precautions for perioperative enteral nutrition in the context of radical gastrectomy for gastric cancer. ② Personalized program development: The responsible nurse understood the implementation of enteral nutrition, the existing problems in nutrition management, self-monitoring, *etc.* Besides, they recorded the daily nutritional intake, wrote a dietary diary, which facilitated the doctor to grasp in a timely manner and adjusted the patient's treatment plan according to the actual situation, reflecting the timeliness and effectiveness of nutrition management. ③ Ability training: Through targeted training by the responsible nurse, patients and their families acquired the skills necessary for dietary quantification and record-keeping, thereby enhancing their ability to manage personalized diets effectively. ④ Nutrition education: Physicians and nutrition specialist nurses performed nutrition education once a week, emphasized the causes of malnutrition, the importance of evaluation and the effectiveness of intervention measures to raise patients' awareness of perioperative nutritional issues. ⑤ Nutrition intervention: Nutrition specialist nurses conducted nutrition assessment and the developed individualized nutritional program once a week. The intervention program was dynamically adjusted to ensure that the daily patient's ability was met. Concurrently, diet supervision and behavior management were enforced, with close monitoring of dietary records and correction of any inaccuracies or omissions. Personalized education and guidance were provided to foster patients' ability to maintain a balanced diet.

2.2.2.4 Perioperative clinical care pathways

Perioperative clinical care pathways are shown in Table 2.

2.3 Outcome measures

2.3.1 Nutritional status

This part contained PG-SGA score, body mass index as well as hemoglobin level.

2.3.2 Postoperative gastrointestinal function indicators

It included bowel sound recovery time, anus exhaust time, defecation time and discharge time.

2.3.3 Gastrointestinal feeding intolerance

Gastrointestinal feeding intolerance such as nausea, vomiting, abdominal distension and diarrhea. Additionally, the frequency of gastrointestinal intolerance was recorded.

2.3.4 Quality of life

One month after operation, the short-term quality of life of the patients was assessed by telephone follow-up and outpatient reexamination using the Digestive Disease Quality of Life Index (GLOI), which mainly included 4 dimensions including social function, psychological emotion, physiological function and subjective symptoms, 36 questions, 0–4 points for each question and 0–144 points for the total score. A higher total score indicates a superior quality of life.

2.4 Statistical methods

SPSS v27.0 (IBM Corp., Armonk, NY, USA) was utilized for data analysis. Measurement data conforming to normal distribution were analyzed by mean \pm standard deviation ($\bar{x} \pm s$). *t*-test was employed to compare the two groups; measurement data not conforming to normal distribution were analyzed by M (P25, P75), Mann-Whitney U test was applied to comparison between groups. Repeated measures analysis of variance was used for comparison at each time point. Enumeration data were expressed as frequency and percentage. χ^2 test was used. Rank sum test was applied to compare rank data. $p < 0.05$ indicated statistically significant differences.

3. Results

3.1 Comparison of nutritional status between the two groups

The observation group performed better in the PG-SGA score. Besides, body mass index and hemoglobin levels were also significantly higher than that in the control group ($p < 0.05$) as shown in Table 3.

3.2 Comparison of postoperative gastrointestinal function indicators between the two groups

The patients in the observation group were conspicuously superior to that in the control group in terms of bowel sound recovery time, anus exhaust time, defecation time and discharge time ($p < 0.05$), as presented in Table 4.

TABLE 2. Perioperative clinical care pathways.

Time	Nursing measures	Responsible person
1 day before surgery	Medical history inquiry and NRS2002 nutritional risk screening Blood examination and body composition measurement Personalized dietary guidance	Nursing team
Day of surgery	Various examination purposes and treatment options discussion Preoperative purpose, importance and adaptation process inform Catheter maintenance purpose explains potential complications notification and postoperative functional exercise examination completion evaluation Preoperative dietary guidance and joint development of activity plan psychological nursing assessment Emphasize the purpose and importance of gastric tube to the family members Explain the precautions of tube nursing Guide of bed functional exercise and foot pump movement of lower limbs	Surgical team, nursing team
1 day after surgery	Intragastric nutrition starting from 0.9% NS 250 mL, pulse 30 mL warm water infusion every 4 h Gastrointestinal discomfort observation and recording Bed activity guidance and blood drawing examination Nutrient solution, 30 mL/h were given according to the patient's condition	Nursing team
2 day after surgery	Bedside activity guidance and sitting—standing—stepping assistance activity precautions guideline Bowel sound was confirmed by auscultation and anus exhaust time was observed Nutrient solution 40–50 mL/h, dynamically adjusted according to tolerance	Nursing team
3 day after surgery	Activity instruction and observation of heart rate and respiration in ward Adjust dosage timely in case of discomfort Auscultation of gastrointestinal sounds	Nursing team
4–5 day after surgery	Blood tests and diet seminars were calculated according to tolerance target speed of 70–80 mL/h Outdoor activity instructions and minimal liquid intake Body weight measurement and body mass index calculation Special lectures on blood examination and diet Oral semiliquid feeding observation	Nursing team
6–9 day after surgery	Body weight measurement and body mass index calculation Blood examination and nutrition special counseling Post-discharge diet planning	Nursing team
1 month after discharge	Health and dietary guidance, establishment of follow-up pathways Satisfaction assessment form distribution Return visits were performed and quality-of-life questionnaires from patients in the past month were collected.	Nursing team

NRS: Nutritional Risk Screening; NS: normal saline.

TABLE 3. Comparison of nutritional status between the two groups ($\bar{x} \pm s$).

Group	Case	PG-SGA (point)	BMI (kg/m ²)	Hemoglobin (ρB/g·L ⁻¹)
Control group	60	5.40 ± 1.14	21.09 ± 1.02	113.15 ± 4.25
Observation group	60	4.30 ± 1.08	22.09 ± 1.09	117.95 ± 4.83
<i>t</i>		3.128	-2.970	-3.339
<i>p</i>		0.003	0.005	0.002

PG-SGA: Patient-Generated Subjective Nutrition Assessment; BMI: Body Mass Index.

3.3 Comparison of gastrointestinal feeding intolerance in both groups

After intervention, the incidence of gastrointestinal intolerance to enteral nutrition in the observation group was notably less than that in the control group, and the difference was statistically significant ($p < 0.05$), as revealed in Table 5.

3.4 Comparison of quality of life in the two groups

The quality of life of patients in the observation group was better than that in the control group, and the difference was statistically significant ($p < 0.05$), as shown in Table 6.

TABLE 4. Comparison of postoperative recovery of gastrointestinal function between the two groups (d).

Group	Case	Gastrointestinal function recovery indicators			
		Bowel sound recovery time	Anus exhaust time	Defecation time	Discharge time
Control group	60	1.67 ± 0.29	1.84 ± 0.27	4.20 ± 0.77	18.90 ± 2.51
Observation group	60	1.26 ± 0.50	1.33 ± 0.51	3.10 ± 1.07	10.61 ± 1.25
<i>t</i>		3.190	3.890	3.733	4.449
<i>p</i>		0.003	<0.001	<0.001	<0.001

TABLE 5. Comparison of the incidence of early enteral nutrition feeding intolerance between the two groups (n (%)).

Group	Case	Nausea and vomiting	Abdominal distension	Abdominal pain	Diarrhoea
Control group	60	13 (21.70%)	11 (18.30%)	8 (13.30%)	12 (20.00%)
Observation group	60	5 (8.50%)	2 (3.30%)	2 (3.30%)	4 (6.70%)
χ^2		4.033	6.988	3.927	4.615
<i>p</i>		0.045	0.008	0.048	0.032

TABLE 6. Comparison of quality of life between the two groups ($\bar{x} \pm s$).

Group	Social functioning	Physiological function	Psycho-emotional	Subjective symptoms	Total score
Control group	13.49 ± 3.66	21.38 ± 5.41	15.47 ± 2.54	68.94 ± 8.80	119.56 ± 12.85
Observation group	10.59 ± 3.55	17.52 ± 5.63	12.05 ± 2.38	59.91 ± 7.63	99.56 ± 12.13
<i>t</i>	3.880	3.386	6.750	5.380	7.771
<i>p</i>	<0.001	<0.001	<0.001	<0.001	<0.001

4. Discussion

4.1 MDT-based nutrition management model can improve the nutritional status of patients undergoing radical gastrectomy for gastric cancer

Patients undergoing radical gastrectomy are susceptible to a myriad of nutritional challenges during the perioperative phase. These encompass preoperative weight loss and malnutrition, postoperative feeding difficulties, issues with nutrient absorption and associated complications, as well as the need for ongoing nutritional support throughout the rehabilitation process [10, 11]. Effective MDT can comprehensively assess patient status, develop personalized treatment plans, reduce surgical risks and improve treatment outcomes. Meanwhile, postoperative rehabilitation, including a balanced diet, physical activity and psychological care, is crucial to preserving the overall well-being of patients. In this context, dietitians are instrumental in addressing nutritional issues and facilitating patient recovery [12]. The results manifested that the nutritional indicators of the observation group were dramatically better than that of the control group. The study demonstrated that the MDT nutrition management model effectively enhances the nutritional status of gastric cancer patients. This is primarily attributed to the model's interdisciplinary nature, involving professionals such as physicians, nurses and dietitians, who collectively offer comprehensive nutritional support tailored to the individual needs of patients [13]. Moreover, the MDT nutrition management model facilitates the creation of personalized nutritional programs based on the unique circumstances of

each patient. For gastric cancer patients, this individualized approach is particularly effective in meeting nutritional requirements by evaluating indicators such as the PG-SGA score, body mass index and hemoglobin levels, allowing for a more precise understanding of the patient's nutritional status and targeted management [14]. As evidenced by the research of Xiang Y and Yu Z [15, 16], the MDT nutrition management model can use the timely adjustment and feedback mechanism to enable the team to adjust the nutrition plan at any time according to the changes in the patient's condition. This ensures the continuity and efficacy of nutrition support, the patient's nutrition supply, and promote the patient's recovery, which is consistent with the outcomes observed of this study.

4.2 MDT-based nutrition management model promoted recovery of gastrointestinal function and reduced the incidence of gastrointestinal intolerance

The study's findings indicate that the observation group experienced expedited postoperative recovery milestones, including earlier first anus exhaust, defecation, bowel sound recovery, eating time and discharge time. The main reason is that under MDT model, the close cooperation between different professionals makes timely intervention and adjustment in patient nutrition management possible. For instance, in cases of gastrointestinal distress, a collective effort by physicians, nurses and dietitians enables swift evaluation and adjustment of dietary regimens or medication, thereby alleviating patient discomfort and fostering gastrointestinal function recovery [17–19]. Meanwhile, the incidence of gastrointestinal intolerance to enteral nutrition in the observation group was

evidently less than that in the control group, and the difference was statistically significant. This can be attributed to several factors: The intervention personnel timely adjusted the nutritional support program by evaluating and recording the nutritional status of the patients to reduce the incidence of complications [20, 21], and the comprehensive assessment of the patient's nutritional status through medical history, NRS2002 nutritional risk screening and PG-SGA score, which forms the basis for personalized dietary plans and reduces the risk of feeding intolerance [22, 23]. Dietary guidance was started on the first day before surgery. Personalized guidance was performed according to risk assessment to guide patients and their families in advance to understand the purpose and importance of enteral nutrition and prepare for enteral nutrition support on the day of surgery [24]. Detailed explanations about the purpose, importance, potential complications and the significance of postoperative functional exercise were provided to patients and their families on the day of surgery, enhancing patient acceptance of enteral nutrition and reducing postoperative feeding intolerance [25]. On the first postoperative day, the patients were instructed and assisted to perform bed functional exercise, including foot pump movement of both lower limbs and raising buttock, while performing sitting up in bed and standing activities to promote intestinal peristalsis and facilitate the early gastrointestinal function recovery [19, 26]. With the increase of postoperative days, the nursing pathway gradually guides the patient to transition from enteral nutrition to oral diet, containing monitoring response, measuring body weight and performing biochemical tests, which helps the patient to adapt more smoothly to a normal diet. The study's results revealed that the social function, physiological function, subjective symptoms, psychological and emotional scores and total scores in the observation group were superior to the control group, and the differences were comparable, indicating that the MDT nutrition management mode could significantly improve the short-term quality of life of patients undergoing radical gastrectomy for gastric cancer. This is largely due to the model's consideration of individual patient differences and disease characteristics, leading to the development of personalized nutritional intervention programs that cater to the patients' nutritional and digestive needs [27]. In summary, the measures allow patients to receive more refined nursing services in the perioperative period, successfully reduce the incidence of feeding intolerance, promote the recovery of gastrointestinal function and enhancing the overall quality of life of patients [28].

4.3 Limitation

Certain limitations are present in this study. Firstly, the sample size is modest, which restricts the comprehensive evaluation of the actual effect. Future studies are recommended to consider expanding the sample size. Moreover, the study duration was relatively brief, failing to thoroughly assess the long-term effects of the MDT nutrition management model. Extending the study period would provide a more profound understanding of the model's long-term efficacy. Finally, in addition to the MDT nutrition management model, other factors that may affect the effect of nutrition management, such as the

lifestyle and mental health of patients, which are not fully considered. Future studies should comprehensively consider these additional variables to achieve a more comprehensive understanding of nutrition management effectiveness.

5. Conclusions

In summary, the MDT nutritional management model has achieved remarkable results in the perioperative nutritional management of gastric cancer patients. The collaborative efforts of a multidisciplinary team have facilitated the creation of personalized dietary regimens, effectively diminishing the incidence of feeding intolerance and expediting the recovery of gastrointestinal function. Besides, it improves nutritional levels of patients, including body mass index and hemoglobin levels, which promoting the short-term quality of life in patients. In the future, we will promote the wide application of MDT-based nutrition management model in the perioperative period of patients with gastric cancer by expanding the study scale, optimizing the study design and introducing the research results into practical clinical practice to provide more comprehensive and personalized nutritional support for patients.

AVAILABILITY OF DATA AND MATERIALS

The authors declare that all data supporting the findings of this study are available within the paper and any raw data can be obtained from the corresponding author upon request.

AUTHOR CONTRIBUTIONS

JJX, HL—designed the study and carried them out; prepared the manuscript for publication and reviewed the draft of the manuscript. JJX, HL, QCL, LPH, GHZ, YCG—supervised the data collection. JJX, HL, QCL, LPH, GHZ—analyzed the data. JJX, HL, QCL, LPH—interpreted the data. All authors have read and approved the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the Ethics Committee of Hangzhou First People's Hospital (Approval no. KY-20230522-0098-01). Written informed consent was obtained from a legally authorized representative for anonymized patient information to be published in this article.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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