Original Article
Enhancing gastrointestinal symptom alleviation in cancer patients after chemotherapy: the effect of whole-course seamless diet nursing and analysis of factors affecting efficacy

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Abstract: This study aimed to evaluate the effects of whole-course seamless diet nursing in the oncology department on alleviating gastrointestinal symptoms in cancer patients after chemotherapy and identify factors influencing its efficacy. Retrospective analysis was conducted on data from 114 cancer patients treated at Sir Run Run Shaw Hospital. Among them, 51 patients who received conventional nursing were assigned to the control group, while 63 patients who received whole-course seamless diet nursing were assigned to the observation group. The observation group showed a significantly higher total response rate in alleviating gastrointestinal symptoms compared to the control group. After nursing, the observation group exhibited improvements in physical function, psychological function, social function, and material life state, along with lower anxiety and depression levels. Logistic regression analysis revealed age, chemotherapy cycle, and nursing scheme as independent risk factors affecting efficacy. The study concluded that whole-course seamless diet nursing in the oncology department effectively alleviates gastrointestinal symptoms, enhances nursing outcomes, and improves patients' quality of life, suggesting its potential for clinical promotion and application.

Keywords: Oncology department, whole-course seamless diet nursing, chemotherapy, gastrointestinal symptoms, risk factors

Introduction

There are an estimated 18.1 million new cancer cases and 9.6 million cancer-related deaths in 2020 [1]. The morbidity and mortality of cancers exhibit significant variation across countries and regions, which can be attributed to differences in risk factors, access to early detection and treatment, and healthcare systems [2]. The most common cancers worldwide are lung cancer, breast cancer, colorectal cancer, prostate cancer and gastric cancer, accounting for over half of all new cancer cases and deaths each year [3].

At present, chemotherapy is a primary treatment for cancer patients in clinical practice [4, 5]. After receiving chemotherapy, patients often suffer adverse gastrointestinal symptoms, which give rise to functional disorders and decreased physiological tolerance, seriously compromising the efficacy and the quality of life (QoL) of patients [6-8]. Conventional nursing approaches often focus primarily on disease-specific interventions and may overlook the importance of targeted dietary nursing, so they may not effectively address adverse gastrointestinal symptoms or achieve optimal outcomes in improving patients' conditions [9, 10]. In recent years, there has been a growing demand for diversified nursing approaches driven by improved living standards and evolving medical nursing concepts.

Clinical research [11, 12] has suggested a crucial role of diet management nursing in prevent-

ing and managing gastrointestinal symptoms in cancer patients during chemotherapy. This nursing approach has been shown to promote the rehabilitation of patients and improve their prognosis.

The whole-course seamless diet nursing in oncology department aims to provide a comprehensive and individualized diet plan to help cancer patients cope with the side effects of chemotherapy and to improve their physical and mental health throughout the treatment process. After targeted dietary interventions, patients can acquire better overall QoL, and actively participate in their rehabilitation process [13].

This study aimed to discuss the effect of whole-course seamless diet nursing in oncology department in preventing and managing the gastrointestinal symptoms in cancer patients undergoing chemotherapy, with the purpose of providing reference for the later clinical practice.

Materials and methods

Inclusion and exclusion criteria

Inclusion criteria: (1) patients who met the clinical diagnostic criteria for cancers and the TNM staging criteria (version 8) issued by American Joint Committee on Cancer (AJCC) [14], and were diagnosed after relevant pathological examinations; (2) patients with detailed medical records; (3) patients without mental disease and consciousness disorder; (4) patients who had received anti-tumor therapy such as multiple radiotherapy and chemotherapy.

Exclusion criteria: (1) patients with cachexia, critical condition or serious organic diseases; (2) patients who were taking psychotropic drugs; (3) patients with primary or secondary digestive cancers, such as gastric cancer and esophageal cancer; (4) follow-up data were incomplete, or follow-up information was lost for other reasons.

Clinical data collection

The baseline data of patients were collected from their electronic medical records, including sex, age, course of disease, pathological type, TNM stage, chemotherapy cycle, surgical histo-

ry, hypertension history and diabetes mellitus history. In addition, generic quality of life inventory-74 (GQOLI-74) score [15], self-rating anxiety scale (SAS) and self-rating depression scale (SDS) [16, 17] were employed for patient assessment before and after treatment. The alleviation of gastrointestinal symptoms after nursing was evaluated and analyzed.

Research subjects

Retrospectively, data of 211 cancer patients who received chemotherapy and treatment in Sir Run Run Shaw Hospital from May 2019 to May 2021 were collected. According to the inclusion and exclusion criteria, 114 patients were finally enrolled as research subjects. Among them, 51 patients who received conventional nursing from May 2019 to May 2020 were enrolled into a control group, and the other 63 who received whole-course seamless diet nursing in oncology department from June 2020 to May 2021 were enrolled into an observation group. This study was carried out with approval of the Medical Ethical Committee of Sir Run Run Shaw Hospital.

Nursing schemes

The control group was given conventional nursing. Specifically, the nurses kept abreast of the patients' disease conditions, and created a comfortable and peaceful medical environment to ensure adequate rest time for the patients. Besides, the nurses provided healthcare knowledge-related education, closely monitored the patients' vital signs, and informed the patients to take drugs following the doctor's advice. Additionally, psychological counselling was provided for patients to relieve negative emotions such as tension and anxiety.

In addition to conventional nursing interventions, the observation group was given whole-course seamless oncology diet nursing. 1) Pre-chemotherapy: Nurses provided patients with chemotherapy-related information and dietary guidance. An individualized diet based on patients' preferences and nutritional needs was offered to increase nutrition and calorie intake 2 weeks before treatment. Patients were advised to eat half their food in the morning and take breaks before eating when fatigued. 2) During chemotherapy: Patients were encouraged to consume high-calorie fruits and vegeta-

bles, polysaccharide-rich foods, and vitamin A supplements to maintain energy levels and improve immunity. They were instructed to fast for 2 hours before treatment, limit food intake during treatment, chew food thoroughly, increase water consumption, and avoid lying down immediately after eating to minimize the risk of vomiting. 3) Post-chemotherapy: Dietary interventions were tailored to patients' gastrointestinal symptoms:

a. Poor appetite: Patients were advised to consume smaller portions and more frequent meals consisting of easily digestible, high-protein, and high-calorie foods. Sweets and greasy dishes were to be avoided. Light exercise before meals was recommended to stimulate appetite.

b. Nausea and vomiting: Patients were advised to consume mild and light food, while limiting 5-HT-rich fruits and vegetables, and drink less water during meals. Antiemetics should be taken according to the doctor's prescription. In cases of severe vomiting, intravenous nutrition should be administered.

c. Oral ulcers: A diet of liquid or semi-liquid food rich in vitamins B and C was recommended, while avoiding hot, acidic, or irritating food. Gargling with saltwater and maintaining suitable indoor humidity were advised to prevent inflammation and infection of oral mucosa.

d. Diarrhea: Patients were advised to eat low-cellulose and high-potassium food, and drink vegetable soups or tomato juice to supplement lost nutrients and electrolytes.

e. Constipation: Consumption of high-fiber soy products, drinking honey water, and performing simple gastrointestinal exercises were advised to promote bowel movements.

Quality control

(1) The members of the intervention group received training about the purpose and contents of the interventions; (2) The selection of subjects strictly followed the corresponding inclusion and exclusion criteria; (3) Regarding the questionnaire, the nurses explained the requirements using unified and standardized instructions, and answered questions raised by subjects in the filling process using a consis-

tent language; (4) The investigations were carried out during the rest time of patients after routine examinations at admission, and during the treatment and nursing intervals before discharge to encourage patient cooperation with the questionnaire survey.

Outcome measures

Primary outcome measures: The efficacy improvement after nursing was compared between the two groups according to the following criteria: markedly effective: the gastrointestinal symptoms basically disappeared; effective: the gastrointestinal symptoms were alleviated; ineffective: the gastrointestinal symptoms did not improve compared with those before intervention. The patients were grouped into an alleviation group and a non-alleviation group according to the efficacy, and logistics regression analysis was conducted to explore risk factors impacting the efficacy in patients.

Secondary outcome measures: The GQOLI-74 was adopted to evaluate the QoL of the patients before and after nursing, and the SAS and SDS were adopted for anxiety and depression evaluation of the patients [16]. The clinical data of the two groups were compared.

Data analyses

This study adopted SPSS 22.0 software for data analyses. Measurement data were expressed by mean ± standard deviation (SD), and analyzed through t test. The paired t test was used for intra-group comparison, and the independent sample t-test was used for inter-group comparison. Counting data were described by number of cases (%), and analyzed through chi-square test. Logistic regression analysis was conducted to understand risk factors affecting the efficacy in patients, and receiver operating characteristic (ROC) curves were drawn to analyze the value of risk factors in evaluating the efficacy in patients. $P < 0.05$ denotes a significant difference.

Results

Comparison of clinical data

According to comparison of patients' clinical data, the control group and observation group were not significantly different in terms of sex,

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

Factors	Control group (n=51)	Observation group (n=63)	X² value	P value
Sex			0.326	0.964
Male	22 (43.14)	33 (52.38)		
Female	29 (56.86)	30 (47.62)		
Age			0.681	0.168
≥60	28 (54.90)	37 (58.73)		
<60	23 (45.10)	26 (41.27)		
Average course of disease (year)			1.376	0.240
≥7	19 (37.25)	17 (26.8)		
<7	32 (62.75)	46 (73.02)		
Pathological types			5.592	0.133
Lung cancer	10 (19.61)	23 (36.51)		
Bladder cancer	12 (23.53)	17 (26.98)		
Cervical cancer	14 (27.45)	10 (15.87)		
Breast cancer	15 (29.41)	13 (20.64)		
TNM staging			2.128	0.144
I-II	15 (26.79)	10 (15.87)		
III-IV	41 (73.21)	53 (84.13)		
Chemotherapy cycle			0.231	0.631
≥2	33 (64.71)	38 (60.32)		
<2	18 (35.29)	25 (39.68)		
Surgery or not			0.228	0.632
Yes	22 (43.14)	30 (47.62)		
No	29 (56.86)	33 (52.38)		
Hypertension history			0.488	0.484
Yes	17 (33.33)	25 (39.68)		
No	34 (66.67)	38 (60.32)		
Diabetes mellitus history			0.072	0.788
Yes	15 (29.41)	20 (31.75)		
No	36 (70.59)	43 (68.25)		

age, average course of disease, pathological type, TNM staging, chemotherapy cycle, surgical history, hypertension history and diabetes mellitus history (P>0.05, **Table 1**).

Changes in QoL before and after nursing

Before nursing, the two groups were not greatly different in physical function, psychological function, social function, and material life state (P>0.05, **Figure 1**). After nursing, the scores of physical function, psychological function, social function, and material life state in the two groups increased significantly (P<0.001, **Figure 1**). Further comparison revealed that the observation group demonstrated significantly better physical function, psychological function, social function, and material life state than the control group (P<0.05, **Figure 1**).

Changes in anxiety and depression before and after nursing

Before nursing, the SAS and SDS scores of the two groups were not significantly different (P>0.05, **Figure 2**). After nursing, the SAS and SDS scores decreased notably in both groups (P<0.001, **Figure 2**). Further comparison revealed notably lower SAS and SDS scores in the observation group than those in the control group after nursing (P<0.001, **Figure 2**).

Alleviation of gastrointestinal symptoms in patients after nursing

According to comparison of gastrointestinal symptoms between the two groups, the control group exhibited a notably lower overall response rate than the observation group in
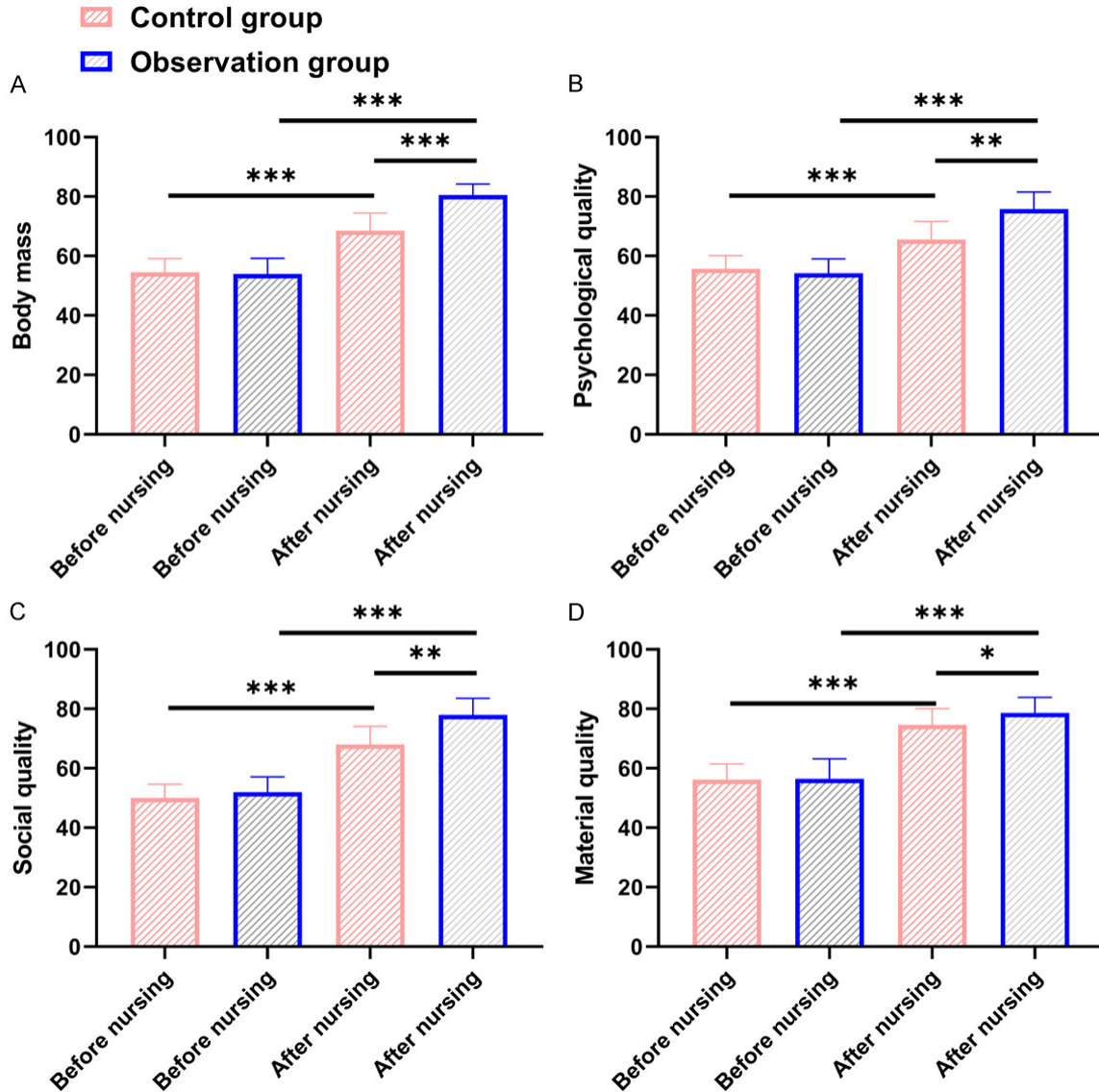
Figure 1. Comparison of patients' quality of life before and after nursing. A. Comparison of physical function scores; B. Comparison of psychological function scores; C. Comparison of social function scores; D. Comparison of material life state scores. Note: *P<0.05; **P<0.01; ***P<0.001.

the alleviation of gastrointestinal symptoms (P=0.005, **Table 2**).

Analysis of risk factors affecting the efficacy in patients

The patients were grouped into an alleviation group (n=97) and a non-alleviation group (n=17) according to the efficacy. According to univariate analysis, age, chemotherapy cycle, surgery experience and nursing scheme were the risk factors impacting the efficacy in patients (**Table 3**, P<0.05). The significant data from univariate analysis were assigned (**Table 4**). According to

logistics regression analysis, age, chemotherapy cycle and nursing scheme were independent risk factors impacting the efficacy (**Table 5**, P<0.05). Then, based on the risk factors, the ROC of indicators in joint prediction was drawn. The results showed that the area under the curve of indicators in joint prediction was 0.862, and the specificity and sensitivity were 88.23% and 76.28%, respectively (**Figure 3**).

Discussion

In clinical practice, chemotherapy-induced digestive system disorders can lead to a series of
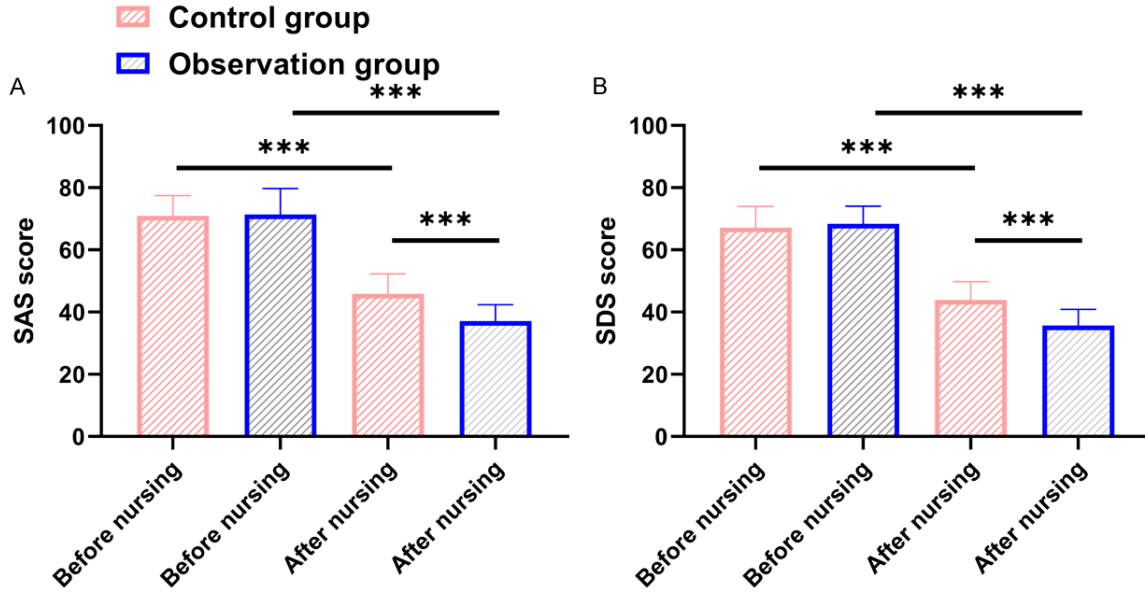
Figure 2. Comparison of SAS and SDS scores in patients before and after nursing. A. Comparison of SAS scores; B. Comparison of SDS scores. Note: ***P<0.001. SAS: self-rating anxiety scale; SDS: self-rating depression scale.

Table 2. Alleviation of gastrointestinal symptoms in patients after nursing [n (%)]

Group	Markedly effective	Effective	Ineffective	Total response rate
Observation group (n=63)	42 (66.67)	17 (26.98)	4 (6.34)	59 (93.66)
Control group (n=51)	21 (41.17)	18 (33.33)	12 (25.50)	39 (74.50)
X^2				6.895
P				0.009

symptoms, such as anorexia, stomach discomfort, nausea and vomiting, oral ulcer, constipation, and diarrhea. These symptoms can compromise patients' nutritional status and body tolerance, and cause a low compliance in diet nursing and reduced QoL. Consequently, this can hinder the recovery process and contribute to a poor prognosis [18, 19].

Patients in oncology department often have complicated conditions, facing a high probability of deterioration, a high risk of complications, and a low cure rate, and they usually suffer from negative emotions after experiencing different psychological stages [20]. Nurses need to adapt to the psychological and emotional changes of patients and their families and provide a humanistic environment for patients. This requires nurses to possess a strong sense of compassion and considerable patience. Conventional nursing measures are simple and

lack a systematic approach, which cannot meet the diverse nursing needs of patients [21]. Therefore, effective diet nursing has become a focus of research on the management of gastrointestinal symptoms in cancer patients undergoing chemotherapy.

According to related research [12, 22], whole-course seamless diet nursing for patients can ensure rich nutrition, improve appetite, and enhance the efficacy of chemotherapy for a good prognosis. This study retrospectively analyzed the efficacy of whole-course seamless diet nursing in alleviating gastrointestinal symptoms in patients after chemotherapy. According to the results, the observation group experienced less gastrointestinal symptoms than the control group after nursing. It is suggested that whole-course seamless diet nursing has a remarkable effect in alleviating gastrointestinal symptoms, contributing to higher clinical efficacy. This is because interventions during whole-course seamless diet nursing were carried out in three stages: before chemotherapy, during chemotherapy and after chemotherapy, and the diet method, food types and diet time were reasonably selected and allocated in order to prevent the occurrence of gastrointes-

Table 3. Univariate analysis of factors impacting efficacy

Factors	Alleviation group (n=97)	Non-alleviation group (n=17)	X² value	P value
Sex			0.176	0.674
Male	46 (47.42)	9 (52.94)		
Female	51 (52.58)	8 (47.06)		
Age			7.945	0.005
≥60	50 (51.55)	15 (88.24)		
<60	47 (48.45)	2 (11.76)		
Average course of disease (year)			0.127	0.721
≥7	30 (30.93)	6 (35.29)		
<7	67 (69.07)	11 (64.71)		
Pathological type			0.628	0.890
Lung cancer	29 (29.9)	4 (23.53)		
Bladder cancer	24 (24.74)	5 (29.41)		
Cervical cancer	21 (21.65)	3 (17.65)		
Breast cancer	23 (23.71)	5 (29.41)		
TNM staging			2.310	0.128
I-II	23 (23.71)	2 (11.76)		
III-IV	74 (76.29)	20 (88.24)		
Chemotherapy cycle			8.620	0.003
≥2	55 (56.7)	16 (94.12)		
<2	42 (43.3)	1 (5.88)		
Surgery or not			7.668	0.005
Yes	39 (40.21)	13 (76.47)		
No	58 (59.79)	4 (23.53)		
Hypertension history			0.896	0.343
Yes	34 (35.05)	8 (47.06)		
No	63 (64.95)	9 (52.94)		
Diabetes mellitus history			0.015	0.900
Yes	30 (30.93)	5 (29.41)		
No	67 (69.07)	12 (70.59)		

Table 4. Assignment

Factors	Assignment
Age (years)	≥60=1, <60=0
Chemotherapy cycle (times)	≥2=1, <2=0
Surgery or not	Yes =1, No =0
Nursing scheme	Control group =1, Observation group =0
Efficacy-based grouping	Markedly effective + effective =0, ineffective =1

Table 5. Logistics regression analysis of independent factors affecting the efficacy in patients

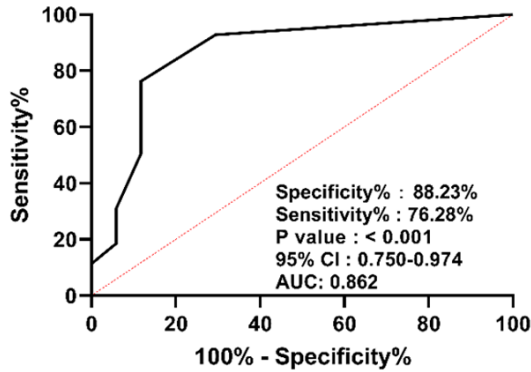| Factors	β	Standard error	X²	P value	OR (95% CI)
Age	2.111	0.834	6.409	0.011	8.258 (1.611-42.336)
Chemotherapy cycle	2.587	1.103	5.503	0.019	13.290 (1.531-115.403)
Surgery or not	1.111	0.692	2.581	0.108	3.037 (0.783-11.780)
Nursing scheme	1.651	0.683	5.839	0.016	5.210 (1.366-19.877)

Figure 3. ROC curve of the joint prediction of efficacy in patients. Note: ROC: receiver operating characteristic.

tinal symptoms in patients through dietary interventions. Additionally, dietary guidance reduces the stimulation to patients with gastrointestinal symptoms and then increases the overall response rate.

In most patients, gastrointestinal symptoms are triggered by factors such as poor mental state, grumpy mood, anxiety, and improper diet [23, 24]. Reportedly, anxiety and depression can greatly reduce the QoL of patients [25]. Accordingly, this study also analyzed patients' QoL and negative emotions before and after nursing. The observation group exhibited notably lower SAS and SDS scores as well as higher GQOLI-74 scores than the control group. Prior research by Lu et al. [30] revealed that comprehensive nursing combined with conventional nursing interventions greatly improved the QoL of patients with gallstones after laparoscopic surgery. Xu et al. [26] revealed in a randomized controlled experiment that compared with conventional nursing, high-quality nursing interventions combined with respiratory function exercise improved the pulmonary function and self-care ability of pulmonary tuberculosis patients and significantly alleviate patients' negative emotions. In this study, whole-course seamless diet nursing in oncology department showed a significant effect on improving patients' QoL and negative emotions. The possible reasons are as follows. During whole-course seamless diet nursing in oncology department, nurses actively engaged in communication with patients to assess their emotional well-being, provided targeted psychological counseling, and distributed educational manuals on dys-

pepsia to the patients. They patiently explained the clinical symptoms, potential causes and preventive measures of comprehensive dyspepsia, helping patients develop a better understanding of the condition and its management. These efforts alleviated negative emotions such as doubts and nervousness, thus improving their QoL.

Clinically, 70%-80% of tumor patients need chemotherapy, and up to 90% of chemotherapy drugs can destroy tumor cells and interfere with normal tissue cells, resulting in a series of side effects such as digestive tract toxicity [27]. Therefore, it is of greatly importance to analyze factors impacting the efficacy and gastrointestinal symptoms. According to our results, age, chemotherapy cycle and nursing scheme were independent risk factors affecting the efficacy in patients. The function of various organs of the body declines with the increase of age, especially the decline of digestive and metabolic systems, which can give rise to malnutrition during the perioperative period of radiotherapy and chemotherapy [28]. For patients over 60 years old or with a course of disease of more than 6 months, special attention should be given to nursing care during the peri-chemo-radiotherapy period, so as to understand their nutritional status in time. A longer chemotherapy cycle means more times of chemotherapy, which continuously increase the burden on the digestive tract [29]. In prior research [30], chemotherapeutic drugs stimulated the chemosensory trigger area in the fourth ventricle, resulting in adverse reactions in the digestive tract. Moreover, these drugs can affect the brain's blood circulation and the production of neurotransmitters, such as dopamine, these neurotransmitters can further exacerbate the adverse reactions in the digestive tract by interacting with chemoreceptor areas and nerve receptors in the brain [31]. Therefore, aiming at the digestive tract reaction of cancer patients, some studies proposed to formulate differentiated intervention procedures. Whole-course seamless diet nursing in oncology department gives all-round nursing in the treatment of diseases, and this care model can be adjusted according to the specific disease conditions, showing promising management ability for gastrointestinal symptoms in tumor patients after chemotherapy by reducing the occurrence of symptoms and accelerating rehabilitation.

This study has retrospectively confirmed a positive effect of whole-course seamless diet nursing in oncology department on alleviating gastrointestinal symptoms in cancer patients after chemotherapy. However, the study still has some limitations. First of all, the sample size in this study is small, and the spanning time for sample inclusion is short. Secondly, the survival data of patients have not been collected in this study, so whether the nursing schemes impact patient prognosis needs further verification. Therefore, we hope to expand the sample size and increase the follow-up indicators in future research. This will allow us to further investigate the benefits and underlying mechanism of whole-course seamless diet nursing in oncology department from multiple perspectives, thereby providing stronger and more comprehensive clinical evidence.

To sum up, the whole-course seamless diet nursing in oncology department has a definite effect in preventing and managing gastrointestinal symptoms in cancer patients undergoing chemotherapy. It can substantially alleviate the gastrointestinal symptoms, optimize the nursing effect, and improve QoL. Based on these findings, we advocate for the promotion and application of seamless diet nursing as an integral part of patient care.

Disclosure of conflict of interest

None.

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