

# Research Progress on Malnutrition and Nutritional Management in Patients with Colorectal Cancer Undergoing Chemotherapy

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**Abstract:** This paper introduces the status quo of malnutrition in patients with colorectal cancer undergoing chemotherapy, and reviews the status quo of nutritional management of patients with colorectal cancer after chemotherapy, in order to provide reference for the whole process of nutritional management in patients with colorectal cancer undergoing chemotherapy.

**Keywords:** Colorectal cancer, Chemotherapy, Nutritional management, Malnutrition

Colorectal cancer (CRC) is a common malignant tumor of the digestive tract. According to the latest data from the International Agency for Research on Cancer (IARC)<sup>[1]</sup>, there will be 1.93 million new cases of colorectal cancer worldwide in 2020, accounting for 10.0% of global cancer incidence, and an estimated 935,000 people will die from colorectal cancer. Cancer accounts for 9.4% of the total cancer deaths, and CRC has become the third most common cancer in the world and the second most deadly<sup>[2]</sup>. Chemotherapy is currently one of the main means of treating colorectal cancer<sup>[3]</sup>. The main role of chemotherapy drugs is to kill or inhibit cancer cells, but they can also affect some normal cells, and cause corresponding toxic and side effects, prompting patients to suffer from malnutrition<sup>[4]</sup>. Studies have confirmed that malnutrition is an independent factor for the poor prognosis of malignant tumors, which reduces the sensitivity of radiotherapy and chemotherapy, and significantly increases the incidence of side effects, which affects the efficiency of chemotherapy and the tolerance of patients, reduces the quality of life of patients, and reduces the survival rate of patients. Survival time, prolonged hospital stay, and increased hospitalization costs<sup>[5]</sup>. Nutritional management is a comprehensive nutritional intervention method that evaluates patients' nutrition and provides reasonable nutritional diet and nutritional support<sup>[6]</sup>. Appropriate nutritional management can significantly improve the quality of life of CRC patients and improve their clinical outcomes<sup>[7]</sup>. Therefore, this article reviews the incidence of malnutrition in CRC patients undergoing chemotherapy and the current status of nutritional management after chemotherapy, aiming to provide a reference for further personalized nutritional management programs for colorectal cancer patients during chemotherapy.

## 1. Current status of malnutrition in patients with colorectal cancer undergoing chemotherapy

According to the survey, 8.9% of colorectal cancer patients suffered from severe malnutrition before receiving chemotherapy due to tumor self-depletion<sup>[8]</sup>. Dewys W D et al found that more than half of CRC patients lost weight before chemotherapy<sup>[9]</sup>. Chemotherapy drugs can also damage normal cells while killing tumor cells, especially gastrointestinal mucosal cells, leading to weight loss, loss of appetite, nausea and vomiting, diarrhea and other adverse reactions<sup>[8,10,11]</sup>, malnutrition further aggravated. Gabrielson, D.K<sup>[12]</sup> et al. conducted a prospective study on CRC patients receiving chemotherapy for the first time and found that 53% of patients had moderate to severe malnutrition before the start of chemotherapy. kg. Zietarska, M et al<sup>[13]</sup> evaluated the nutritional status of 114 elderly patients with colorectal cancer chemotherapy, and found that 76% of the patients suffered from malnutrition risk and malnutrition during chemotherapy, and 37% of the patients suffered from moderate loss of appetite. The average body weight of the patients decreased by about 6.7Kg within one month. A survey by Liu Hanxue, a Chinese scholar<sup>[14]</sup>, showed that 77.3% of rectal cancer patients gradually lost body weight after radiotherapy and chemotherapy, and 22.7% of patients lost more than

5.0% of their body weight. The patient is moderately to severely malnourished. Long-term malnutrition may make patients intolerant to chemotherapy, and some patients may terminate treatment because of this [15,16], and even reduce survival time, leading to death of patients [5,17]. To sum up, patients with colorectal cancer not only suffer from malnutrition before chemotherapy, but also have a higher incidence of malnutrition after chemotherapy. It is imminent to implement nutritional management throughout the process.

## **2. Status quo of nutritional management in patients with colorectal cancer undergoing chemotherapy**

Malnutrition is a common phenomenon in patients with colorectal cancer during chemotherapy, and malnutrition changes dynamically with the course of chemotherapy<sup>[12,18]</sup>. It has become an important part of comprehensive treatment for cancer patients to implement full, close, dynamic and effective nutritional management for patients undergoing chemotherapy. [6]. The European Society for Clinical Nutrition and Metabolism (ESPEN) pointed out that the process of nutritional management includes four parts: nutritional screening, nutritional assessment, nutritional therapy, and nutritional monitoring and evaluation [19]. The ESPEN panel highlighted three key steps in the management of cancer feeding tubes: (1) early screening for nutritional risk in all cancer patients, regardless of body weight and body mass index; (2) expanding nutrition-related assessment practices, including measures of anorexia, body composition, inflammatory biomarkers, resting energy expenditure, and physical function; (3) use of a multimodal nutritional intervention with an individualized plan that includes a focus on increasing nutrient intake, reducing inflammation and high metabolic stress, and increasing Nursing for physical activity.

### **2.1 Nutritional risk screening and assessment**

Nutritional screening and assessment are two distinct processes, the former indicating risk factors for malnutrition and the latter providing a nutritional diagnosis. Although the clinical nutritional assessment of cancer patients has always attracted much attention, there is no unified gold standard for the assessment of the nutritional status of CRC patients at home and abroad [20], and nutritional risk screening and nutritional assessment in the clinical diagnosis and treatment process have not been fully covered [21]. Nurses are the main implementers of nutritional risk and assessment in my country. According to a survey by Deng Jing et al. [22], 32.42% of nurses in the oncology department did not conduct nutritional risk screening or nutritional assessment for cancer patients, and the department was responsible for nutritional risk screening. The survey and evaluation personnel are mainly nurses, accounting for 80.41% and 70.27%. There are four main clinical nutritional risk screening and assessment tools: nutritional risk screening-2002 (nutritional risk screening-2002, NRS 2002), patient-generated subjective global assessment (PG-SGA), mini nutritional assessment scale (mini nutritional assessment, MNA), malnutrition universal screening scale (malnutrition universal screening tool, MUST). NRS 2002 is a nutritional risk screening tool recommended by ESPEN guidelines applicable to different environments (community, hospital, and the elderly) [23], and is also the recommended nutrition for inpatients jointly recommended by ESPEN and the Society of Parenteral and Enteral Nutrition of the Chinese Medical Association. The preferred tool for risk screening [24,25], and recent studies have confirmed that NRS 2002 is also applicable to cancer patients [26]. The disadvantage of this scale is that its use is limited for patients who cannot stand or cannot accurately measure body fat. PG-SGA is a nutritional assessment tool specially developed for cancer patients based on the subjective global assessment (SGA) [27]. The scale can be used for both nutritional screening and nutritional assessment. It is recommended by the American Dietetic Association (ADA) and the Cancer and Nutritional Support Professional Committee (CSONSC) of the Chinese Anti-Cancer Association as the preferred tool for nutritional assessment of cancer patients [28]. PG-SGA can quickly identify and prioritize malnutrition in hospitalized cancer patients [27], compared with NRS 2002, PG-SGA is a more appropriate screening tool for detecting malnutrition risk in patients with malignancies [29,30], higher diagnostic sensitivity for malnutrition [27]. MNA is recommended as the tool of choice for nutritional assessment of elderly hospitalized patients [31]. It can not only reflect the nutritional status and current treatment of patients, but also predict the mortality and hospitalization expenses of patients [32,33]. MUST is a nutritional screening tool developed by the British Society for Parenteral and Enteral Nutrition in 2003. It is generally used for the screening of protein-energy malnutrition and the risk of occurrence. Miyuki Tagawa et al [34] confirmed that MUST is a very useful and simplified nutritional screening tool for CRC patients undergoing chemotherapy.

## **2.2 Nutritional intervention**

### **2.2.1 Timing of nutritional intervention**

The "Guidelines for Nutritional Therapy for Colorectal Cancer" recommends that patients with colorectal cancer who experience malnutrition during chemotherapy should be given nutritional support [35]. The nutritional therapy guidelines for chemotherapy patients point out that the indications for the initiation of nutritional therapy for chemotherapy patients are: (1) Malnutrition already exists; (2) Estimated daily intake < 60% of estimated energy consumption and duration > 10 days, or the estimated time that the patient cannot eat > 7 days; (3) For patients who have lost more than 5% of their recent body weight due to insufficient nutritional intake [36].

### **2.2.2 Nutritional intervention methods**

The ways of nutritional support include enteral nutrition support and parenteral nutrition support. Enteral nutrition support includes oral and tube feeding. Enteral nutritional support is preferred when nutritional counseling fails to meet caloric requirements and there is a fully or partially functioning gastrointestinal tract [37,38]. Oral supplementation is a simple, non-invasive way to increase nutrient intake in patients who are unable to meet their nutritional needs despite dietary counseling [39]. Early nutritional education and nutritional supplementation have been shown to reduce the incidence of malnutrition, reduce chemotherapy-induced adverse reactions, and prolong survival. Renata Dobrila-Dintinjana et al [40] conducted a prospective study on patients with advanced CRC chemotherapy, the results showed that after the end of chemotherapy, patients who received nutritional counseling and oral nutritional support had BMI<20, NST≥5, loss of appetite and weight loss The proportion of patients was lower, and the survival period of the group receiving early nutritional support was prolonged [39]. Enteral tube feeding is indicated for patients whose nutritional needs cannot be met through oral intake alone. Zuo Hao et al. [41] showed that the body mass index, serum protein content, and transferrin content of elderly CRC patients who received enteral nutrition support were higher than those in the control group; the incidence of complications (10.00%) was significantly lower than that of the control group. group (26.67%).

### **2.2.3 Management mode of nutrition management**

In recent years, the concept of multidisciplinary collaboration (MDT) nutritional management has been widely used clinically [42]. Cheng Ke et al [43] implemented nutritional intervention on CRC patients receiving neoadjuvant chemotherapy using the case manager-led MDT model, and the results showed that the level of nutritional indicators in the study group was significantly better than that in the control group (P<0.05). Similar to Liang Pin's [44] research results. Scholar Fen Zhao set up a nutrition management team to explore the effect of nutritional intervention under team management on the nutritional status of colorectal cancer patients undergoing chemotherapy. The results showed that the nutritional status of CRC patients was significantly improved, and the incidence of adverse reactions during chemotherapy was significantly reduced [42]. The home nutrition (HN) support model is a nursing service model that extends nursing services from hospitals to communities and families, including home enteral nutrition and home parenteral nutrition. The development of the home parenteral nutrition model has been limited by the high incidence of complications. Home enteral nutrition is an important part of nutritional support, and it is also a supplement and continuation of enteral nutrition in hospitals. In our country, HN is mostly treated by family enteral nutrition, and most of the caregivers are family members. Due to factors such as age, education level, and nursing experience, some family members have poor nutritional support for patients. Therefore, the patient's discharge guidance needs to be carried out in advance, and the training and assessment of catheter care, preparation of homogenate meal, nutrient solution infusion, and nasal feeding operation procedures should be conducted in advance to ensure that patients and their families have sufficient time to digest and understand. Because the family enteral nutrition support process is more complicated. Nutritional support groups need to be established for monitoring and training, but the establishment of nutritional support groups in my country is still immature, which limits the development of family nutritional support, and most family enteral nutrition support lacks monitoring and management. Whole-course nutritional management is a refined, comprehensive and continuous nutritional support mode, including the entire treatment process and after discharge. Studies have confirmed that nutritional intervention for patients with advanced short-term radiotherapy combined with chemotherapy can improve the nutritional status of chemotherapy patients, enhance immune function, improve the quality of life, and ensure the continuation of treatment [45]. There are still deficiencies in the formulation of individual nutrition and dietary plans in management. In the whole nutrition management, there is no unified standard or model for the dynamic diagnosis, evaluation and monitoring of patients after discharge.

### 3. Nutritional evaluation

Serum albumin, prealbumin, and transferrin are all effective laboratory indicators that reflect early nutritional disorders in the body, and are tools for nutritional evaluation and prognosis evaluation<sup>[36]</sup>. Albumin has a long half-life, slow response to protein storage, and cannot reflect the nutritional status of patients in time. However, the half-life of prealbumin is only 2.5 days, which can reflect the nutritional status of the patient in a timely manner. After the patient is malnourished and given sufficient protein intake, it will increase rapidly and can dynamically monitor the nutritional intake of the patient. Transferrin will also change significantly after 7 days of nutritional support, and it can also be used as an early indicator to evaluate the recovery of the nutritional status of patients. BMI is an important marker for assessing the risk of malnutrition, and many studies have elucidated the role of BMI in the prognosis of CRC. In addition, anthropometric indicators such as triceps skinfold thickness (TSF), arm circumference (AMC), bioelectrical impedance, and creatinine height index are also important indicators for evaluating nutritional status, but these indicators require professional training. After measurement, the current clinical application is less. Follow-up is also a part of clinical application efficacy evaluation. The main research focuses on the intervention effect of different follow-up methods. The current research has different requirements for follow-up personnel, follow-up methods and follow-up content. At present, the content of follow-up in continuous nutritional management is still being explored, there is no uniform standard.

### 4. Conclusion

At present, the nutritional management of cancer patients has been closely watched by scholars from many countries. Although my country has formulated guidelines for nutritional therapy for colorectal cancer and nutritional therapy for chemotherapy patients, they mainly focus on diet and energy supply during chemotherapy, so there is still a lack of practical guidelines for nutritional management and nursing of colorectal cancer patients undergoing chemotherapy, especially for post-discharge intermittent chemotherapy. Nutritional screening and evaluation tools are mostly imported from abroad, lacking local targeted nutritional screening and evaluation tools suitable for colorectal cancer chemotherapy patients. In addition, due to the lack of nutrition professionals in my country, nutritional interventions for patients are often delayed. In the nutritional education of responsible nurses before chemotherapy and during hospitalization, there are few studies on nutrition management during chemotherapy intervals and after chemotherapy for colorectal cancer patients. How to learn from the current effective nutritional intervention measures for chemotherapy patients and integrate nutritional intervention and its effects. It is a problem that needs to be solved in the future at the beginning of the treatment and continues to the end of the treatment.

### References

- [1] Cao Maomao, Chen Wanqing. *Interpretation of GLOBOCAN 2020 Global Cancer Statistics [J]. Chinese Medical Frontiers (Electronic Edition), 2021, 13(03):63-69.*
- [2] Kalan U, Arik F, Isik A T, et al. *Nutritional profiles of older adults according to the Mini-Nutritional Assessment[J]. Aging Clin Exp Res, 2020, 32(4):673-680.*
- [3] Wang Xiuqing, Zhan Zhixiang, Liao Lingfeng. *The effect of capecitabine combined with thalidomide metronomic chemotherapy on the quality of life of patients with advanced colorectal cancer [J]. Exploration of Rational Drug Use in China, 2018, 15(11):42-44.*
- [4] Xu Chao, Zhang Gang, Wang Fang, et al. *Analysis of nutritional status and influencing factors of cancer chemotherapy patients in a hospital in Hainan [J]. Hainan Medicine, 2017, 28(23):3940-3942.*
- [5] He Yanling, Cai Hua, Zhang Junling, et al. *Research progress on nutritional status and nutritional therapy of colorectal cancer patients undergoing chemotherapy [J]. Electronic Journal of Cancer Metabolism and Nutrition, 2020, 7(02):245-249.*
- [6] An Shuqin. *Problems and Countermeasures in Hospital Nutrition Management [J]. World Latest Medical Information Abstracts, 2016, 16(29):159-166.*
- [7] Thompson K L, Elliott L, Fuchs-Tarlovsky V, et al. *Oncology Evidence-Based Nutrition Practice Guideline for Adults[J]. Journal of the Academy of Nutrition and Dietetics, 2017, 117(2):297-310.*
- [8] Wang Haiyan. *Investigation on Nutritional Status and Influencing Factors of Colorectal Cancer Patients During Chemotherapy[D]. Jilin University, 2020.*
- [9] Dewys W D, Begg C, Lavin P T, et al. *Prognostic effect of weight loss prior to chemotherapy in cancer patients. Eastern Cooperative Oncology Group[J]. Am J Med, 1980, 69(4):491-497.*

- [10] Wang Gangyan, Luo Huihua. *The influence of malnutrition-related factors and metabolic pathways on the prognosis of patients with colorectal cancer [J]. Advances in Modern General Surgery in China, 2019, 22(06):496-498.*
- [11] Wang Fu. *Observation on the Effect of Chemotherapy Combined with Thalidomide and Jianpi Yangyin Huoxue Decoction in the Treatment of Advanced Colorectal Cancer Complicated with Severe Malnutrition [J]. Chinese Journal of Anorectal Diseases, 2021, 41(10):8-10.*
- [12] Gabrielson D K, Brezden-Masley C, Keith M, et al. *Evaluation of Nutritional, Inflammatory, and Fatty Acid Status in Patients with Gastric and Colorectal Cancer Receiving Chemotherapy[J]. Nutr Cancer, 2021, 73(3): 420-432.*
- [13] Zięarska M, Krawczyk-Lipiec J, Kraj L, et al. *Chemotherapy-Related Toxicity, Nutritional Status and Quality of Life in Precachectic Oncologic Patients with, or without, High Protein Nutritional Support. A Prospective, Randomized Study [J]. Nutrients, 2017, 9(10).*
- [14] Liu Hanxue, Lu Zhenqi, Xie Mingzhu. *Investigation and analysis of nutritional status of rectal cancer patients during neoadjuvant chemotherapy [J]. Journal of Nursing Science, 2018, 33(11):5-8.*
- [15] Gao Liujie, Shao Tingting, Zheng Wanzhen, et al. *Effect of nutrition education combined with oral nutritional supplementation on clinical outcomes of colorectal cancer patients undergoing chemotherapy [J]. Chinese Journal of Clinical Health Care, 2020, 23(02):223-225.*
- [16] Li Jingchang, Jiang Zhixiong, Zhang Zhihong, et al. *Effects of comprehensive nutritional intervention on nutritional status and quality of life of chemotherapy patients with advanced colorectal cancer [J]. Modern Oncology, 2019, 27(05): 800-804.*
- [17] Dignam J J, Polite B N, Others G, et al. *Body mass index and outcomes in patients who receive adjuvant chemotherapy for colon cancer[J]. J Natl Cancer Inst, 2006, 98(22):1647-1654.*
- [18] Fu Mengli. *Nutritional risk survey and analysis of influencing factors in postoperative chemotherapy patients with colorectal cancer [J]. Chinese Journal of Anorectal Diseases, 2018, 38(11):24-26.*
- [19] Arends J, Bachmann P, Baracos V, et al. *ESPEN guidelines on nutrition in cancer patients. Clin Nutr. 2017; 36(1):11-48. doi:10.1016/j.clnu.2016.07.015*
- [20] Gu Xiaojing, Han Juan, Zhang Haiying. *Research progress on nutritional assessment of colorectal cancer patients [J]. Evidence-Based Nursing, 2017, 3(02):131-136.*
- [21] Correia M. *Nutrition Screening vs Nutrition Assessment: What's the Difference? [J]. Nutr Clin Pract, 2018, 33(1):62-72.*
- [22] Deng Jing, Xu Huiqiong, Li Hongjuan, et al. *Investigation on the status quo of nutritional management forms and oncology nurses' nutritional cognition in 20 hospitals in Southwest China [J]. Journal of Nurses Training, 2021, 36(20):1863-1866.*
- [23] Kondrup J, Allison S P, Elia M, et al. *ESPEN guidelines for nutrition screening 2002[J]. Clin Nutr; 2003, 22(4):415-421.*
- [24] Cederholm T, Barazzoni R, Austin P, et al. *ESPEN guidelines on definitions and terminology of clinical nutrition[J]. Clin Nutr; 2017, 36(1):49-64.*
- [25] Kondrup J, Allison S P, Elia M, et al. *ESPEN Guidelines for Nutrition Screening 2002[J]. Clinical Nutrition -Quarterly Then Bimonthly-, 2003.*
- [26] Lu Ting, Ying Yanping, Xu Yi, et al. *Comparative study of grip strength and NRS 2002 in nutritional risk screening of patients with malignant tumors [J]. Journal of Nursing, 2021, 28:1-4.*
- [27] Bauer J, Capra S, Ferguson M L. *Use of the scored Patient-Generated Subjective Global Assessment (PG-SGA) as a nutrition assessment tool in patients with cancer[J]. European Journal of Clinical Nutrition, 2002, 56(8):779-785.*
- [28] Ottery F D. *Rethinking nutritional support of the cancer patient: the new field of nutritional oncology [J]. Semin Oncol, 1994, 21(6):770-778.*
- [29] Zhang Y H, Xie F Y, Chen Y W, et al. *Evaluating the Nutritional Status of Oncology Patients and Its Association with Quality of Life[J]. Biomed Environ Sci, 2018, 31(9):637-644.*
- [30] Du H, Liu B, Xie Y, et al. *Comparison of different methods for nutrition assessment in patients with tumors [J]. Oncol Lett, 2017, 14(1):165-170.*
- [31] Guigoz Y. *The Mini Nutritional Assessment (MNA) review of the literature--What does it tell us? [J]. J Nutr Health Aging, 2006, 10(6):466-485, 485-487.*
- [32] Vellas B, Guigoz Y, Garry P J, et al. *The Mini Nutritional Assessment (MNA) and its use in grading the nutritional state of elderly patients [J]. Nutrition, 1999, 15(2):116-122.*
- [33] Gazzotti C, Albert A, Pepinster A, et al. *Clinical usefulness of the mini nutritional assessment (MNA) scale in geriatric medicine[J]. J Nutr Health Aging, 2000, 4(3):176-181.*
- [34] Tagawa M, Myotoku M, Iwamoto C, et al. *[Nutritional assessment employing the malnutrition universal screening tool for patients with colorectal cancer undergoing outpatient chemotherapy][J]. Gan to Kagaku Ryoho, 2013, 40(9):1185 -1188.*

- [35] *Guidelines for nutritional therapy of colorectal cancer [J]. Electronic Journal of Cancer Metabolism and Nutrition, 2016, 3(03):164-165.*
- [36] *Guidelines for nutritional therapy of chemotherapy patients[J]. Electronic Journal of Cancer Metabolism and Nutrition, 2016, 3(03):158-163.*
- [37] Li Tao, Li Baosheng, Lu Jiahua, et al. *Guidelines for nutritional therapy for patients with esophageal cancer [J]. Electronic Journal of Cancer Metabolism and Nutrition, 2020, 7(01):32-42.*
- [38] Wang Yelin, Gan Wei, Su Qin, et al. *Study on nutritional knowledge awareness status and nutritional intervention effect of colon cancer patients [J]. Nursing Practice and Research, 2017, 14(16):1-3.*
- [39] van Bokhorst-de V D S M. *Nutritional support strategies for malnourished cancer patients[J]. Eur J Oncol Nurs, 2005, 9 Suppl 2:S74-S83.*
- [40] Dobrila-Dintinjana R, Trivanovic D, Zelić M, et al. *Nutritional support in patients with colorectal cancer during chemotherapy: does it work?[J]. Hepatogastroenterology, 2013, 60(123):475-480.*
- [41] Zuo Hao, Yan Dongsheng, Li Xiangwei, et al. *Effect of immune-enhanced enteral nutrition support combined with chemotherapy on nutritional status and immune function in elderly patients with advanced colorectal cancer [J]. Chinese Contemporary Medicine, 2021, 28(33): 108-111.*
- [42] Zhao Fen. *The effect of nutritional intervention under team management on the nutritional status of colorectal cancer patients undergoing intraperitoneal hyperthermic perfusion chemotherapy [J]. Primary Medical Forum, 2020, 24(36):5309-5310.*
- [43] Cheng Ke, Li Yanhong, Deng Yinghui. *Application of case manager-led multidisciplinary collaboration model in nutritional management of colorectal cancer patients with neoadjuvant chemotherapy [J]. Nursing of Integrated Traditional Chinese and Western Medicine (Chinese and English), 2020, 6(02):125-128.*
- [44] Liang Pin. *The effect of personalized nutritional management on the nutritional status of patients with malignant tumors of the digestive system [J]. Medical Theory and Practice, 2020, 33(05):840-841.*
- [45] Wang Xiaoling, Wu Xueliang, Kong Lingxia, et al. *Effects of whole-course refined nutrition management on nutritional status, immune function and quality of life in patients with advanced rectal cancer treated with short-course radiotherapy combined with chemotherapy [J]. Chongqing Medicine, 2020, 49(11):1769-1773.*