

# Intestinal Rehabilitation Plan for Patients with Colorectal Cancer During the Perioperative Period: An Evidence Synthesis

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**Objective:** To retrieve, evaluate, and synthesize the best available evidence regarding perioperative intestinal rehabilitation programs for patients with colorectal cancer, and to provide a reference for clinical nursing practice.

**Methods:** A systematic search was conducted in BMJ Best Practice, GIN, the National Institute for Health and Care Excellence, the Registered Nurses' Association of Ontario, Medline (via PubMed), the Cochrane Library, Web of Science, China National Knowledge Infrastructure (CNKI), Wanfang Database, VIP Database, China Biology Medicine disc (CBM), and the Chinese Society for Parenteral and Enteral Nutrition of the Chinese Medical Association. The search encompassed clinical guidelines, evidence summaries, systematic reviews, expert consensus statements, and other relevant evidence pertaining to intestinal management in patients following colorectal cancer surgery. The retrieval period spanned from the inception of each database to August 2025. Two researchers with training in evidence-based practice independently assessed the methodological quality of the included studies, followed by data extraction and thematic synthesis of the evidence.

**Results:** A total of 16 articles were included, comprising 2 guidelines, 9 systematic reviews, 3 evidence summaries, and 2 expert consensus documents. The evidence was synthesized across six domains: preoperative nutritional management, prehabilitation and bowel preparation, intraoperative surgical management, postoperative nutritional support, postoperative mobility management, and management of drains and symptoms. A total of 23 evidence-based recommendations were identified and summarized.

**Conclusion:** This study synthesizes the current evidence regarding intestinal rehabilitation programs for patients with colorectal cancer during the perioperative period. Nursing professionals should critically evaluate clinical contexts, apply evidence-based practices, and develop scientifically sound, individualized intestinal rehabilitation protocols. Such an approach supports the advancement of a nursing-led, multidisciplinary model of personalized rehabilitation, thereby enhancing both nursing quality and patient recovery outcomes.

**Keywords:** colorectal cancer, intestinal management, intestinal rehabilitation, nutritional management, evidence summary

## Introduction

Colorectal cancer (CRC) is the third most commonly diagnosed malignancy worldwide. According to global cancer statistics from 2023, CRC ranked third in incidence among all malignant tumors in 2020, while ranking second in mortality.<sup>1,2</sup> Posing a significant threat to public health and patient survival. Projections indicate that by 2030, the global burden of CRC may exceed 2.2 million new cases and 1.1 million deaths annually, with an emerging trend toward earlier onset age.<sup>3</sup> Currently, surgical intervention remains the primary treatment modality for colorectal cancer, with low anterior resection (LAR) being the preferred surgical approach for patients with resectable rectal cancer. However, approximately 70% to 90% of patients may experience a constellation of postoperative symptoms, including increased bowel frequency, defecatory urgency, incomplete evacuation, and fecal incontinence. These symptoms are collectively recognized as low anterior resection syndrome (LARS), a condition that may persist for several years or even indefinitely,



significantly impairing patients' physical well-being, psychological health, and social functioning.<sup>4</sup> Although the precise pathophysiological mechanisms underlying LARS have not been fully elucidated, it is widely accepted among scholars that the syndrome arises from the interplay of multiple contributing factors.<sup>5,6</sup> Furthermore, research indicates that the incidence of gastrointestinal dysfunction following abdominal surgery is as high as 19%, characterized by varying degrees of abdominal distension, nausea, vomiting, and delayed passage of flatus or stool. These symptoms not only adversely affect patients' well-being but also significantly impede postoperative recovery.<sup>7,8</sup> However, current clinical interventions primarily emphasize symptomatic treatment following symptom onset, and systematic approaches to prevention and management remain insufficient.

The concept of Enhanced Recovery After Surgery (ERAS) was first introduced by the Danish surgeon Henrik Kehlet in 1997. The core principle of ERAS involves minimizing surgical stress responses, optimizing patients' metabolic status, and reducing the incidence of postoperative complications, thereby promoting faster recovery and improving the efficiency of healthcare resource utilization. Within the ERAS framework, intestinal rehabilitation serves as a critical element of preoperative prehabilitation, aiming to enhance patients' physiological reserves and psychological resilience through comprehensive interventions such as nutritional optimization and psychological support, thus establishing a solid foundation for rapid postoperative recovery.<sup>9</sup> Currently, although several clinical practice guidelines and expert consensus statements on enhanced recovery after colorectal cancer surgery have been published both domestically and internationally, the evidence pertaining to perioperative intestinal rehabilitation management remains fragmented and has not yet coalesced into a systematic, structured clinical pathway. This study aims to establish evidence-based recommendations for perioperative bowel management by synthesizing the best available evidence on bowel rehabilitation in colorectal cancer patients, thereby improving patient outcomes.

## Methods

### Problem Establishment

This study addressed the clinical issue of "bowel management in perioperative patients with colorectal cancer" and formulated this clinical question into an evidence-based inquiry using the PIPOST framework. The target population (P) comprised perioperative patients with colorectal cancer aged 18 years or older. The intervention (I) involved a comprehensive set of bowel management strategies, including dietary regulation, physical activity, pharmacological interventions, and related measures. The professionals involved (P) were clinical healthcare providers responsible for patient care. Key outcomes (O) included time to first flatus, time to first defecation, length of hospital stay, and incidence of postoperative complications. The setting (S) encompassed both in-hospital and outpatient environments. The type of evidence (T) considered included clinical practice guidelines, evidence summaries, systematic reviews, clinical decisions, expert consensus statements, and expert opinions. This study has been registered at the Evidence-Based Nursing Center of Fudan University under registration number ES20257329.

### Evidence Retrieval

A top-down search approach was conducted based on the pyramid-shaped "6S" evidence model, using key terms including "colorectal cancer" and "colorectal neoplasms", in combination with concepts related to bowel management, bowel assessment, excretion measures, dietary management, and perioperative care (including preoperative and postoperative phases), as well as operative procedures and physical activity, for database retrieval. The literature search was conducted within the following sources: (1) decision support systems, including BMJ Best Practice; (2) clinical practice guideline repositories, such as the Guidelines International Network (GIN), the National Institute for Health and Care Excellence (NICE), the Registered Nurses' Association of Ontario (RNAO), and the Medical Pulse Guide Network; (3) academic databases, including PubMed, the Cochrane Library, Web of Science, CNKI, Wanfang Database, VIP Database, and the China Biology Medicine disc (CBM); and (4) professional organization websites, specifically the Chinese Society for Parenteral and Enteral Nutrition (CSPEN). The search period spanned from the inception of each database to August 2025.

## Inclusion and Exclusion Criteria of Evidence

Inclusion criteria: 1) Participants were aged  $\geq 18$  years and diagnosed with colorectal cancer; 2) The intervention involved a comprehensive set of bowel management strategies, including dietary management, physical activity management, pharmacological management, and gut microbiota regulation; 3) Eligible evidence encompassed clinical guidelines, best practice recommendations, evidence summaries, systematic reviews, expert consensus statements, and randomized controlled trials (RCTs) published in English or Chinese. Exclusion criteria: 1) Duplicate publications; 2) Studies presented as conference abstracts, research protocols, or narrative reviews; 3) Articles lacking full-text availability; 4) Literature assessed as having low methodological quality (C-level evidence).

## Quality Evaluation of the Literature

Clinical decisions are informed by high-quality evidence, which is directly integrated into practice. The Appraisal of Guidelines for Research Evaluation II (AGREE II) instrument was employed to assess the methodological quality of the included guidelines. Each item was rated on a 7-point scale, ranging from 1 (strongly disagree) to 7 (strongly agree). Domain scores were standardized using the formula:  $[(\text{observed score} - \text{minimum possible score}) / (\text{maximum possible score} - \text{minimum possible score})] \times 100\%$ . A domain was classified as Grade A if its standardized score was  $\geq 60\%$ . Guidelines were assigned an overall Grade B if at least three domains achieved standardized scores of  $\geq 30\%$ , and Grade C if fewer than three domains scored  $\geq 30\%$ . The quality of opinion- and consensus-based literature was assessed using the expert consensus appraisal checklist developed by the Joanna Briggs Institute (JBI) Evidence-Based Healthcare Centre, Australia (2016). Systematic reviews were evaluated using the JBI Critical Appraisal Checklist for Systematic Reviews. The task was independently completed by two researchers with expertise in evidence-based nursing, and the final results were reached following discussions within the local research group to resolve any discrepancies in evaluation.

## Evidence Extraction and Summary

Two researchers independently extracted and synthesized relevant evidence from the included studies. The extracted information encompassed the source, type, theme, and publication domain of each study. Evidence integration was conducted based on consistency across studies; where discrepancies occurred, higher-quality evidence and findings from the most recent authoritative publications were prioritized. The JBI Evidence Grading System for Evidence-Based Health Care (2014) was applied to assess the quality of the original studies underlying the extracted evidence. Depending on the research design, evidence levels were categorized into five tiers, with Level 1 representing the highest quality and Level 5 the lowest.

## Results

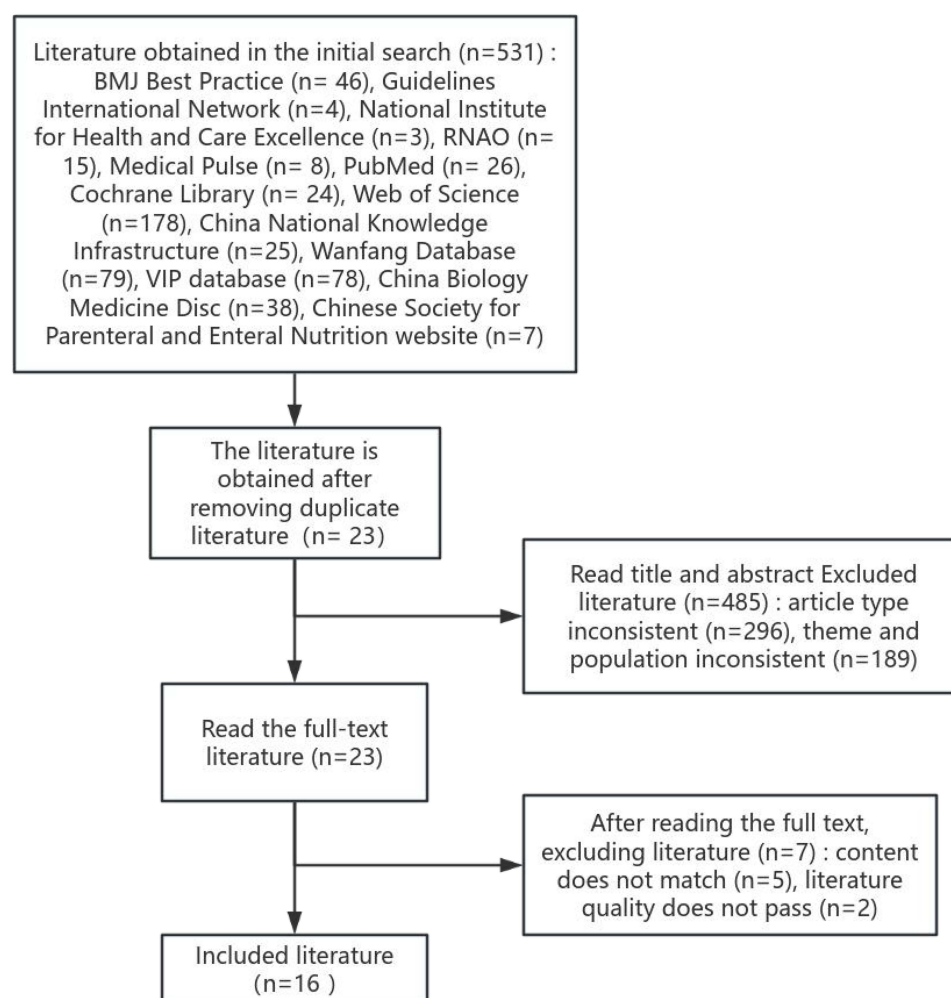
### Literature Search Results

A comprehensive initial search yielded a total of 531 potentially relevant documents. Following the removal of 23 duplicate records, the remaining documents were rigorously screened based on predefined inclusion and exclusion criteria. Ultimately, 16 documents were selected for inclusion in the analysis, comprising 2 clinical guidelines, 2 expert consensus statements, 3 evidence summaries, and 9 systematic reviews. The detailed screening process is illustrated in [Figure 1](#), while the general characteristics of the included literature are summarized in [Table 1](#).

### Literature Quality Evaluation Results

This study incorporated two guidelines, with their respective quality assessments and recommendation levels summarized in [Table 2](#).

A total of three evidence summaries were included, from which three pieces of evidence were extracted. The original sources of each piece of evidence were traced and evaluated. Among these, two pieces were derived from two clinical practice guidelines and one from a systematic review, all of which were assessed as being of high quality according to established criteria and therefore included in the analysis.



**Figure 1** Literature screening process.

Nine systematic reviews were included, sourced from PubMed, the China National Knowledge Infrastructure (CNKI), and the Wanfang Database. In three of the studies, the item “whether publication bias was assessed” was rated as “no”, with all other items rated as “yes”. In one study, the item “whether the method of combining studies was appropriate” was rated as “unclear”, while all remaining items were rated as “yes”. For the remaining five studies, all assessment items were rated as “yes”.

A total of two expert consensus documents were included, and the evaluation results for all items were affirmative.

## Summary and Description of Evidence

Evidence was synthesized across six domains: preoperative nutritional management, prehabilitation and bowel preparation, intraoperative surgical management, postoperative nutritional support, postoperative activity promotion, and management of drains and symptoms. A total of 23 evidence statements were identified as the best available evidence, as summarized in Table 3.

## Discussion

### Patients with Colorectal Cancer Should Promptly Complete Nutritional Risk Screening and Assessment

The nutritional status of patients with colorectal cancer plays a crucial role in determining overall survival outcomes. Evidence indicates that the prevalence of moderate to severe malnutrition among these patients ranges from 27% to

**Table 1** Basic Characteristics of Included Studies (n=16)

| Author                                                 | Year of Publication | Source           | Type of Literature  | The Literature Theme                                                                                                                                            |
|--------------------------------------------------------|---------------------|------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Gustafsson <sup>10</sup>                               | 2025                | YIMAITONG        | Guideline           | Perioperative Nursing Care in Elective Colorectal Surgery                                                                                                       |
| Nicole <sup>11</sup>                                   | 2022                | YIMAITONG        | Guideline           | Evaluation and Management of Perioperative Frailty in Elderly Patients Undergoing Colorectal Surgery                                                            |
| Zuo <sup>12</sup>                                      | 2024                | CNKI             | Summary of Evidence | Nutritional Management in the Perioperative Period of Colorectal Cancer Patients Under the Framework of Enhanced Recovery After Surgery                         |
| Liu <sup>13</sup>                                      | 2022                | CNKI             | Summary of Evidence | Enhance the recovery of gastrointestinal function in patients with colorectal cancer during the perioperative period                                            |
| Fan <sup>14</sup>                                      | 2023                | CNKI             | Summary of Evidence | Prevention and Management of Low Anterior Resection Syndrome                                                                                                    |
| Jeong Kim <sup>15</sup>                                | 2025                | Pubmed           | Systematic review   | The efficacy of pelvic floor muscle training in postoperative rehabilitation for patients following low anterior resection surgery                              |
| Lanlan Zheng <sup>16</sup>                             | 2025                | Pubmed           | Systematic review   | The efficacy of non-pharmacological interventions in restoring intestinal peristalsis following colorectal cancer surgery                                       |
| Lin Qi <sup>17</sup>                                   | 2023                | Pubmed           | Systematic review   | The effect of acupuncture on postoperative recovery following colorectal cancer surgery                                                                         |
| Yi-Shu Liao <sup>18</sup>                              | 2024                | Pubmed           | Systematic review   | Prehabilitation interventions for patients undergoing colorectal cancer surgery                                                                                 |
| Huang <sup>19</sup>                                    | 2024                | CNKI             | Systematic review   | The impact of chewing gum on gastrointestinal function following colorectal cancer surgery                                                                      |
| Song <sup>20</sup>                                     | 2015                | Wanfang database | Systematic review   | The application of enhanced recovery after surgery (ERAS) protocols in laparoscopic surgery for elderly patients with colorectal cancer: evaluation of efficacy |
| Wen <sup>21</sup>                                      | 2017                | Wanfang database | Systematic review   | The impact of chewing gum on intestinal function following colorectal cancer surgery                                                                            |
| Zhang <sup>22</sup>                                    | 2021                | CNKI             | Systematic review   | The effect of preoperative enteral nutrition on postoperative recovery in patients with colorectal cancer                                                       |
| Zhou <sup>23</sup>                                     | 2024                | CNKI             | Systematic review   | The therapeutic efficacy of acupuncture in managing postoperative gastrointestinal dysfunction following colorectal cancer surgery                              |
| Chinese Society of Nutritional Oncology <sup>24</sup>  | 2022                | Wanfang database | Expert consensus    | Nutritional Therapy in Patients with Colorectal Cancer                                                                                                          |
| The Chinese Society of Colorectal Cancer <sup>25</sup> | 2020                | YIMAITONG        | Expert consensus    | Perioperative Management of Elderly Patients with Colorectal Tumors in China                                                                                    |

**Table 2** Quality Assessment of Included Guidelines (n=2)

| Guidelines               | Standardized Scores in Various Domains (%) |                         |        |         |               |              | ≥60% | ≥30% | Quality Grade |
|--------------------------|--------------------------------------------|-------------------------|--------|---------|---------------|--------------|------|------|---------------|
|                          | Scope and Purpose                          | Stakeholder Involvement | Rigour | Clarity | Applicability | Independence |      |      |               |
| Gustafsson <sup>10</sup> | 75%                                        | 67%                     | 59%    | 61%     | 31%           | 98%          | 4    | 6    | B             |
| Nicole <sup>11</sup>     | 69%                                        | 50%                     | 56%    | 72%     | 50%           | 87%          | 3    | 6    | B             |

40%,<sup>26,27</sup> and approximately 10% to 20% of patients succumb to nutrition-related complications.<sup>28</sup> Malnutrition significantly impairs clinical outcomes, reduces survival duration, and diminishes the quality of life in patients undergoing colorectal cancer surgery.<sup>29</sup> Studies have demonstrated that for every one-unit increase in the prognostic nutritional index among patients with colorectal cancer, the three-year overall survival rate increases by 1.2%.<sup>30</sup> Furthermore, a Chinese multicenter study has further demonstrated that over half of colorectal cancer patients were malnourished

**Table 3** Summary of Evidence for the Intestinal Rehabilitation Plan for Patients with Colorectal Cancer During the Perioperative Period

| Management Stage | Subject                                                  | Description of Evidence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Evidence Level                                    |
|------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Preoperative     | Nutrition management                                     | <p>1. All patients undergo a systematic nutritional risk screening upon admission, with their nutritional status being re-evaluated prior to surgery. Validated assessment tools, such as NRS2002 or PG-SGA, are recommended for use in routine clinical practice.</p> <p>2. For patients with malnutrition, it is recommended to initiate enhanced nutritional support 7 to 10 days prior to surgery. Protein intake should be maintained at 1.2–1.5 g/kg/day or higher, with enteral nutrition preferred as the primary approach. In cases where rapid improvement of nutritional status is necessary, parenteral nutrition may be administered in combination with enteral feeding.</p> <p>3. Patients with normal gastrointestinal function are administered whole-protein nutritional formulations prior to surgery. For patients exhibiting impaired gastrointestinal function or malabsorption disorders, amino acid-based or short peptide-based nutritional formulations are recommended to support adequate nutritional supplementation.</p> <p>4. Immunonutrition was administered for 5 to 7 days prior to surgery to reduce the risk of postoperative infection.</p> <p>5. Clear fluids or carbohydrate-containing beverages (eg, 400 mL of a solution containing 12.5% carbohydrates) may be consumed up to two hours prior to anesthesia induction. Solid foods must be withheld at least six hours before the scheduled procedure.</p> | <p>1b</p> <p>1b</p> <p>5b</p> <p>1b</p> <p>1a</p> |
|                  | Pre-rehabilitation management and intestinal preparation | <p>6. Implement individualized preoperative health education using tools such as virtual reality and visual aids to effectively alleviate patient anxiety.</p> <p>7. A minimum of four weeks of abstinence from smoking and alcohol consumption should be completed prior to surgery. The prehabilitation program should be individualized based on a comprehensive patient assessment, rather than adhering to a one-size-fits-all standardized protocol.</p> <p>8. Mechanical bowel preparation is not routinely recommended in colon surgery; however, it may be considered in cases of rectal surgery involving stoma formation, provided that it is administered in conjunction with oral antibiotics.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>1b</p> <p>3b</p> <p>1a</p>                     |
| During operation | Surgical management                                      | <p>9. Minimally invasive surgical techniques are commonly employed in clinical practice.</p> <p>10. During the procedure, it is essential to maintain a mild positive fluid balance while ensuring that body weight does not increase by more than 2.5 kilograms.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>1b</p> <p>1c</p>                               |

|               |                               |                                                                                                                                                                                                                                                                                                                                                    |    |
|---------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Postoperation | Nutrition management          | 11. Oral feeding should be initiated within 24 hours after surgery. It is recommended to administer oral nutritional supplements providing at least 500 kcal per day for a duration of 3 to 5 days. For patients with preexisting malnutrition, continued supplementation for a minimum of 2 to 3 months is advised.                               | 5b |
|               |                               | 12. If necessary, an immune-nutrient formula containing arginine, omega-3 fatty acids, and related components may be administered; however, the duration of use should not exceed seven days.                                                                                                                                                      | 1b |
|               |                               | 13. In the early postoperative period, soluble dietary fiber supplementation may be considered, and laxatives such as lactulose may be administered as clinically appropriate to facilitate intestinal function recovery.                                                                                                                          | 5b |
|               |                               | 14. Consuming coffee, whether caffeinated or decaffeinated, postoperatively may help stimulate gastrointestinal motility.                                                                                                                                                                                                                          | 1a |
|               | Activity Management           | 15. With effective pain management, patients may adopt a semi-recumbent position or remain in bed following surgery without the necessity of lying flat for 6 hours. They may gradually begin to sit up, stand, and ambulate as early as 4 hours postoperatively.                                                                                  | 1a |
|               |                               | 16. Starting from the first day post-operation, maintain physical activity by remaining out of bed for at least three hours daily or by walking a distance equivalent to 6000 steps or more.                                                                                                                                                       | 1b |
|               |                               | 17. Pelvic floor muscle training should be initiated as early as possible following surgery, performed 3 to 5 times daily for 10 to 15 minutes per session, and continued consistently for a duration of 3 to 6 months.                                                                                                                            | 1d |
|               | Tubing and symptom management | 18. Postoperatively, abdominal drainage tubes and nasogastric tubes are not routinely retained. Urinary catheters are typically removed within 24 hours after minimally invasive colonic surgery and within 48 hours following rectal surgery.                                                                                                     | 1c |
|               |                               | 19. Multimodal analgesic strategies, including the use of acetaminophen, are recommended. For colon surgeries, non-steroidal anti-inflammatory drugs (NSAIDs) may be administered; however, in rectal surgeries, non-selective NSAIDs should be avoided due to potential complications.                                                            | 1a |
|               |                               | 20. Dexamethasone and ondansetron were administered for the prophylaxis of postoperative nausea and vomiting. In cases where prophylactic measures proved ineffective, alternative antiemetic agents with distinct mechanisms of action were utilized, and repeated administration of the same agent was avoided within 6 hours following surgery. | 1a |
|               |                               | 21. Appropriate traditional Chinese medicine (TCM) interventions, such as acupuncture and acupoint application, may be considered on the first postoperative day to facilitate the recovery of gastrointestinal function and alleviate postoperative nausea and vomiting.                                                                          | 1a |
|               |                               | 22. To prevent intestinal obstruction, multimodal intervention strategies are recommended, such as early enteral feeding, gum chewing, probiotic supplementation, and the use of laxatives.                                                                                                                                                        | 1a |
|               |                               | 23. A defecation diary was utilized to monitor the frequency and characteristics of bowel movements.                                                                                                                                                                                                                                               | 4a |



according to PG-SGA assessment, with malnutrition identified as an independent risk factor for postoperative infections.<sup>31</sup> This indicates that nutritional management plays a critical role in determining prognosis, with the efficacy of nutritional interventions being closely dependent on the timeliness and precision of nutritional support. It is noteworthy that nutritional metabolic status is closely associated with the anatomical location of colorectal tumors. Evidence from multiple studies indicates that right-sided colon cancer typically manifests as a protruding lesion, characterized by an insidious onset and predominant systemic symptoms—including abdominal pain, anemia, and unintentional weight loss—which often result in early-onset nutritional deterioration. In contrast, left-sided colon and rectal cancers are more frequently detected at earlier stages due to the presence of localized symptoms, with nutritional impairments tending to develop progressively during the course of treatment. Consequently, tailored nutritional assessment and intervention strategies should be implemented according to tumor location.<sup>32,33</sup> According to the Guidelines for the Clinical Application of Parenteral and Enteral Nutrition in Chinese Adults (2023 Edition), nutritional screening and assessment should be initiated within 24 hours of admission and maintained continuously throughout the entire diagnostic and therapeutic process.<sup>34</sup> Therefore, standardized tools should be promptly utilized to conduct nutritional risk screening and assessment prior to surgery and consistently throughout the entire diagnostic and treatment process, playing a critical role in preventing complications, optimizing gastrointestinal management, and improving patient outcomes.

## An Optimized Surgical Pathway Integrating Prehabilitation, Minimally Invasive Techniques, and Precise Fluid Management

Colorectal tumors, along with the associated surgical trauma, can induce systemic inflammatory responses and physiological stress, resulting in hormonal imbalances that may impair the recovery of patients' physiological functions.<sup>35</sup> Therefore, establishing a prehabilitation management plan based on individualized assessment, optimizing the surgical approach, and precisely managing intraoperative fluid administration are crucial for enhancing postoperative recovery. The concept of prehabilitation integrates the core principles of Enhanced Recovery After Surgery (ERAS) into the preoperative phase, with intervention strategies extending beyond nutritional support to include improvements in physical fitness and psychological well-being.<sup>36</sup> Prehabilitation should be tailored according to individual patient assessments and leverage the synergistic effects of various intervention modalities. With ongoing advancements in surgical techniques, minimally invasive surgery has become a mainstream approach in the treatment of colorectal cancer. Its primary advantage lies in minimizing tissue trauma and intraoperative blood loss through precise operative techniques and smaller incisions, thereby reducing postoperative inflammatory responses and establishing a solid foundation for accelerated patient recovery.<sup>37,38</sup> Furthermore, research has demonstrated that precise fluid management significantly influences the short-term and medium-term clinical outcomes, as well as the long-term mortality rates of surgical patients.<sup>39</sup> During surgical anesthesia, maintaining adequate blood volume is critical. However, excessive fluid administration may disrupt homeostasis by increasing interstitial hydrostatic pressure, thereby prolonging the oxygen diffusion distance and impairing gas exchange efficiency between alveoli and pulmonary capillaries. While restrictive fluid management can mitigate these risks, it may compromise tissue perfusion, potentially leading to energy metabolism disturbances and subsequent multiple organ dysfunction syndrome.<sup>40</sup> A retrospective cohort study demonstrates that intraoperative total fluid administration exceeding 3,200 mL or net fluid balance surpassing 2,350 mL is significantly associated with an increased risk of severe postoperative complications in patients.<sup>41</sup> The precise implementation of perioperative fluid management is a critical factor that directly influences patient outcomes, reduces postoperative complications, and enhances the overall safety and efficacy of surgical procedures. Establishing an optimized surgical pathway that integrates prehabilitation, minimally invasive techniques, and meticulous fluid management holds significant value in improving recovery outcomes and preventing complications in patients with colorectal cancer.



## Postoperative Rehabilitation Should Follow the Principles of “Early Initiation, Active Movement, and Assisted Recovery” to Promote Gastrointestinal Function

Postoperative intestinal rehabilitation is a systematic intervention aimed at promoting the early and orderly recovery of gastrointestinal motility and digestive function. The evidence summarized in this study supports a postoperative management strategy centered on the principles of “early intervention, proactive care, and comprehensive support.” Early oral feeding following colorectal cancer surgery has been demonstrated to be safe and well-tolerated. Evidence indicates that gastrointestinal function in patients undergoing colorectal cancer surgery typically recovers rapidly postoperatively. The colonic function typically recovers within 2 to 3 hours, while digestive and absorptive functions recover within 12 hours, and gastric motility is restored within 24 hours.<sup>42</sup> A systematic review demonstrated that initiating food intake 6 to 12 hours after surgery was associated with improved early postoperative bowel recovery, shorter hospital stays, and reduced incidence of postoperative complications compared to delaying feeding until 12 to 24 hours postoperatively.<sup>43</sup> At the same time, early postoperative mobilization plays a crucial role in the postoperative care regimen. Evidence from one study indicates that a goal-directed early mobilization rehabilitation program can enhance recovery following gastrointestinal surgery, improve patients’ motor function, and facilitate the restoration of multi-organ physiological function.<sup>44</sup> In addition, various auxiliary technologies exert a notable influence on the recovery of gastrointestinal function in patients with colorectal cancer following surgery. Incorporating soluble dietary fiber into routine nutritional support can produce a synergistic effect, effectively preventing postoperative abdominal distension and constipation, while also optimizing nutrient absorption and enhancing immune function through the promotion of beneficial gut microbiota, thereby reducing the incidence of complications.<sup>45</sup> Appropriate traditional Chinese medicine interventions, such as acupuncture and acupoint application, have demonstrated efficacy in preventing and alleviating nausea and vomiting, reducing abdominal distension, promoting the recovery of gastrointestinal function, and improving patients’ psychological well-being. These modalities serve as valuable adjunctive approaches in perioperative management.<sup>46</sup>

## Multimodal Strategies Were Used to Manage Common Postoperative Symptoms

Postoperative nausea and vomiting, pain, and intestinal obstruction are common complications that significantly impact patient recovery and postoperative comfort. A multimodal management approach is essential for effectively enhancing patient well-being and improving clinical outcomes. Postoperative pain primarily arises from central sensitization, peripheral sensitization, tissue injury, or infection, often accompanied by the release of pro-inflammatory mediators.<sup>47</sup> Multimodal analgesia enhances postoperative patient comfort through precise analgesic techniques, individualized pain management strategies, and optimized approaches to pain treatment. Given that colorectal cancer patients are at high risk for postoperative nausea and vomiting (PONV), timely identification of individuals at moderate to high risk, combined with the administration of appropriate prophylactic and therapeutic interventions, can effectively reduce the incidence of these adverse events.<sup>48</sup> In addition, to prevent postoperative intestinal obstruction and infection, various preventive and therapeutic strategies, including early postoperative nutritional support and multimodal pharmacological interventions, are employed.<sup>49,50</sup> These comprehensive measures collectively form an optimized strategy for postoperative symptom management following colorectal cancer surgery, with the objective of enhancing patient recovery outcomes.

## Conclusion

This study synthesizes six key domains and 23 evidence-based recommendations pertaining to perioperative bowel rehabilitation programs for colorectal cancer. The findings indicate that establishing a comprehensive, individualized management system—encompassing preoperative nutritional screening and prehabilitation, intraoperative minimally invasive techniques and precise fluid management, and postoperative multimodal rehabilitation guided by the principles of “early intervention, active mobilization, and supportive care”—is essential for reducing postoperative complications, accelerating gastrointestinal functional recovery, and enhancing long-term quality of life. The primary limitation of this study is the heterogeneity in the quality of evidence across the included literature. Future research should prioritize conducting high-quality randomized controlled trials to further validate the efficacy of perioperative intestinal rehabilitation programs in patients with colorectal cancer.

## Data Sharing Statement

The original data involved in the paper can be obtained from the references.

## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors report no competing interests in this work.

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