

Review

Best Evidence Summary for Early Oral Feeding after Colorectal Cancer Surgery

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Abstract: To systematically retrieve and summarize the best evidence on early oral feeding after colorectal cancer surgery. Following the evidence-based "6S" evidence model, we searched for clinical decisions, guidelines, evidence summaries, expert consensus, systematic reviews, and randomized controlled trials (RCTs) published from January 2018 to May 2024. Two researchers trained in evidence-based nursing independently evaluated the quality of the literature and extracted evidence that met the quality criteria. A total of 22 articles were included, comprising 4 clinical decisions, 8 guidelines, 5 expert consensus, 3 systematic reviews, and 2 RCTs. Twenty-nine pieces of evidence were summarized across seven dimensions: safety, contraindications, nutritional risk screening and malnutrition assessment, principles of nutritional therapy, energy and protein management, feeding protocols, and tolerance assessment and assurance. The best evidence on early oral feeding after colorectal cancer surgery summarized in this study is scientific and systematic. It provides a theoretical basis for optimizing nutritional support strategies and improving nutritional management in clinical practice, and serves as a reference for evidence-based practice.

Keywords: colorectal cancer; early postoperative period; early oral feeding; evidence-based nursing

1. Introduction

Colorectal cancer (CRC) is a common malignancy worldwide. In China, there were 517,100 new cases and 240,000 deaths in 2022, with both incidence and mortality rates ranking among the highest in the country [1-2]. Radical surgery remains the primary treatment modality, yet postoperative complication rates range from 24.6% to 48.3% [3-4]. Nutritional status is an independent prognostic factor, and at least one-third of patients present with preoperative malnutrition [5-6]. Early oral feeding (EOF) is a core component of Enhanced Recovery After Surgery (ERAS) [7]. Multiple studies have demonstrated that initiating EOF within 24 hours postoperatively improves nutritional status, promotes gastrointestinal function recovery, shortens hospital stay, and does not increase complication rates [8-9].

However, existing evidence predominantly focuses on oral nutritional supplements and early enteral nutrition, with insufficient description of specific feeding protocols and inconsistent recommendations, making it difficult to guide clinical practice effectively [10-14]. Therefore, this study systematically searched and evaluated available evidence to summarize the best evidence on early oral feeding after colorectal cancer surgery, aiming to provide an evidence-based reference for optimizing clinical nutritional management.

2. Materials and Methods

Received: 31 May 2026

Revised: 14 July 2026

Accepted: 29 July 2026

Published: 01 August 2026



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Institute (JBI) critical appraisal tools (2016 version)[18]. Systematic reviews were appraised using the AMSTAR II criteria [19]. Two researchers trained in evidence-based nursing independently completed the quality appraisal. Disagreements were resolved through discussion or by consultation with a third evidence-based methodology expert.

2.5. Evidence Extraction and Synthesis

Two nursing master's students trained in evidence-based nursing independently read the included articles, extracted evidence related to early oral feeding after colorectal cancer surgery, and completed translation. A colorectal nursing specialist proficient in English reviewed the translations. Evidence synthesis followed these principles: (1) similar evidence was merged; (2) complementary evidence was logically integrated; (3) conflicting evidence was resolved by prioritizing evidence-based sources, higher-quality studies, and more recent publications.

2.6. Evidence Grading

Evidence was graded using the 2014 JBI Evidence Pre-grading and Recommendation Level System, with two recommendation levels: A (strong recommendation) and B (weak recommendation) [15, 20].

3. Results

3.1. General Characteristics of Included Literature

A total of 3,012 relevant articles were retrieved. The screening process is shown in Figure 2. Twenty-two articles were finally included: 4 clinical decisions, 8 guidelines, 5 expert consensuses, 3 systematic reviews, and 2 RCTs. The general characteristics are presented in Table 1.

Table 1. General Characteristics of Included Studies (N=22)

Included literature	Source	Type	Topic	Year
Rocco Ricciardi et al. [21]	UpToDate	Clinical decision	Enhanced recovery after colorectal surgery	2023
Kathleen S Romanowski et al. [22]	UpToDate	Clinical decision	Overview of perioperative nutrition support	2024
David Seres et al. [23]	UpToDate	Clinical decision	Nutrition support in critically ill adults	2024
Nicole Siparsky et al. [24]	UpToDate	Clinical decision	Postoperative fluid therapy in adults	2023
Chinese Society of Surgery [25]	Yimaitong	Guideline	Chinese ERAS clinical practice guideline (2021) (Part 1)	2021
Chinese Society of Surgery [26]	Yimaitong	Guideline	Chinese ERAS clinical practice guideline (2021) (Part 5)	2021
Chinese Society for Parenteral and Enteral Nutrition [27]	Yimaitong	Guideline	Clinical application guideline for parenteral and enteral nutrition in Chinese adults (2023)	2023
China Anti-Cancer Association Nutrition Committee [28]	Yimaitong	Guideline	Oral nutritional supplement guideline update	2023
Muscaritoli M et al. [29]	ESPEN	Guideline	ESPEN clinical nutrition guideline in cancer	2021
Weimann A et al. [30]	ESPEN	Guideline	ESPEN clinical nutrition guideline in surgery	2021
Gustafsson UO et al. [31]	PubMed	Guideline	ERAS perioperative care in elective colorectal surgery	2019
Irani JL et al. [13]	ASCRS	Guideline	Enhanced recovery after colon and rectal surgery	2023

Chinese Society of Colorectal Surgery [14]	Yimaitong	Expert consensus	Perioperative nutrition therapy in colorectal cancer (2019)	2019
Guangdong ERAS Society [32]	Yimaitong	Expert consensus	ONS management in enhanced recovery for colorectal surgery (2018)	2018
Chinese Colorectal Cancer Professional Committee [33]	Yimaitong	Expert consensus	Perioperative management in elderly colorectal cancer patients (2020)	2020
China Anti-Cancer Association Nutrition Committee [34]	Yimaitong	Expert consensus	Nutrition therapy in colorectal cancer patients	2022
Chinese Society of Gastrointestinal Surgery [10]	CNKI	Expert consensus	Perioperative nutrition management in gastrointestinal surgery (2021)	2021
MacVicar E et al. [34]	Web of Science	Systematic review	Post-operative oral fluid intake on ileus after elective colorectal surgery	2022
Herbert G et al. [8]	Cochrane Library	Systematic review	Early enteral nutrition within 24 h of lower gastrointestinal surgery	2019
Reece L et al. [36]	Embase	Systematic review	Oral nutrition interventions in gastrointestinal cancer surgery	2020
Rinninella E et al. [9]	PubMed	RCT	NutriCatt protocol in ERAS for colorectal surgery	2018
Wang AH et al. [11]	VIP	RCT	Precision oral nutrition guidance in ERAS for colorectal cancer	2023

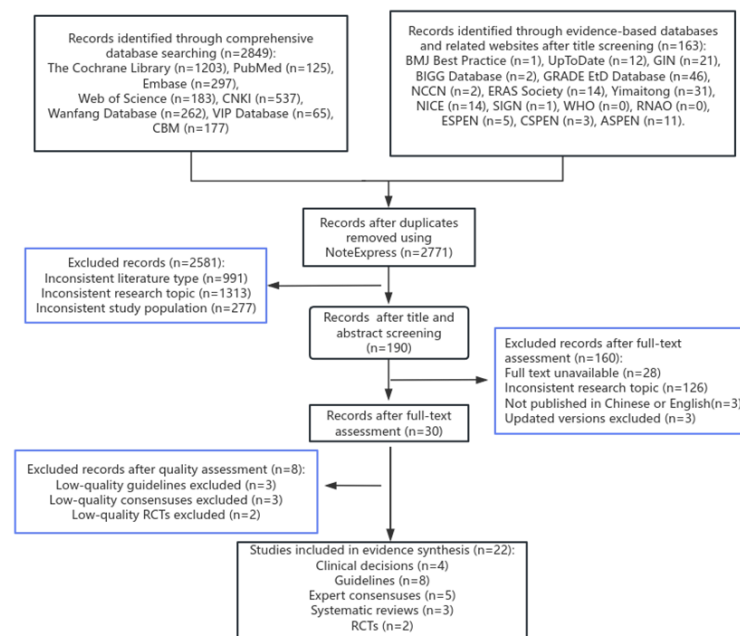


Figure 2. Prisma Flow Diagram of the Study Selection Process

3.2. Quality Appraisal Results

3.2.1. Guideline Appraisal

Eight guidelines were included, of which three were rated Grade A and five Grade B (Table 2).

Table 2. Guideline Quality Appraisal Results $n=8$

Included literature	Scope & purpose	Stakeholder involvement	Rigor of development	Clarity of presentation	Applicability	Editorial independence	Domains $\geq 60\%$	Domains $\geq 60\%$	Grade
Chinese Society of Surgery [25]	80.56	44.44	63.55	97.22	62.50	70.83	5	1	B
Chinese Society of Surgery [26]	75	47.22	63.54	100	62.5	70.83	6	0	A
CSPEN [27]	83.33	55.55	89.58	86.11	72.91	100	5	1	B
China Anti-Cancer Association [28]	88.88	72.22	66.45	83.33	45.83	41.66	4	2	B
Muscaritoli M et al. [29]	88.88	55.55	89.58	97.22	64.58	100	5	1	B
Weimann A et al. [30]	100	61.11	55.21	100	66.66	100	5	1	B
Irani JL et al. [13]	83.33	66.67	85.41	88.88	62.5	100	6	0	A
Gustafsson UO et al. [31]	88.88	72.22	85.42	77.77	68.75	100	6	0	A

3.2.2. Expert Consensus Appraisal

All five expert consensus were rated "yes" on all items, indicating high quality; all were included.

3.2.3. Systematic Review Appraisal

Among the three systematic reviews, Herbert et al. was rated "partially yes" on item 7 (provision of excluded literature list), and "not applicable" on items 11 and 16, with all other items rated "yes." [8]. MacVicar et al. and Reece et al. were rated "yes" on all items. All three systematic reviews were of sufficient quality for inclusion [35, 36].

3.2.4. RCT Appraisal

Wang et al. did not clearly describe blinding of participants and did not include all randomized participants in the final analysis due to dropout, with all other 11 items rated "yes." [11]. Rinninella et al. did not clearly describe blinding of interventionists, but follow-up was complete and outcome measures were reliable [9]. Although both studies had some limitations in blinding description, key methodological aspects (baseline comparability, allocation concealment, blinding of outcome assessors) were well controlled, and both were included.

3.3. Evidence Synthesis and Grading

Twenty-nine pieces of evidence were extracted from the 22 included articles, organized into seven dimensions: safety, contraindications, nutritional risk screening and assessment, nutritional therapy principles, energy and protein management, feeding protocols, and tolerance assessment. Evidence was graded using the 2014 JBI Evidence Pre-grading System (in this study, 1a = systematic review of RCTs, 1b = single RCT, 5b = expert consensus or guideline recommendation), with recommendations based on feasibility and clinical applicability Table 3 [20].

Table 3. Best Evidence Summary for Early Oral Feeding After Colorectal Cancer Surgery

Dimension	Evidence	Level	Recommendation
1. Safety	1. Early oral feeding reduces infection rates, improves nutritional status, shortens hospital stay, and does not increase the risk of	1a	A

	anastomotic leakage or vomiting [10, 13, 14, 22, 25, 26, 30–32, 34, 35].		
	2. Provides nutritional substrates, reduces hypercatabolic response and insulin resistance [8,10,26].	1a	A
	3. Promotes intestinal function recovery, maintains intestinal mucosal barrier, and prevents dysbiosis and bacterial translocation [10,13,25].	3a	B
Contra indicat ions	4. Patients with gastrointestinal motility disorders, mesenteric ischemia, complex anastomotic leakage, intestinal fistula, abdominal infection, gastrointestinal bleeding, severe infection, shock, severe malnutrition with intestinal wall edema, or debilitation should not receive early oral feeding; recommend early PN [10, 30, 32].	2b	B
	5. Establish a multidisciplinary team (physician, dietitian, rehabilitation specialist, pharmacist, specialist nurse) from diagnosis to provide standardized nutritional care covering screening, assessment, diagnosis, intervention, and monitoring [27,29].	3a	B
Nutri tional risk screeni ng & assess ment	6. Complete nutritional risk screening as early as possible after admission; patients with nutritional risk should receive further nutritional assessment and malnutrition diagnosis [32].	5c	B
	7. NRS-2002 recommended as screening tool [10,27,28,32,34]: <3 points = no risk, screen weekly [14]; ≥3 points = nutritional risk, further assessment needed[10,14,27,32,34]; ≥5 points = high risk, nutritional therapy needed [10,34].	1a	A
	8. PG-SGA recommended for nutritional assessment [14,32,34], combined with dietary survey, anthropometric measurements, laboratory tests, and body composition analysis for individualized planning [27,29].	2b	B
	9. GLIM criteria recommended for malnutrition diagnosis [10,27,28].	3a	B
Princip les of nutriti onal therap y	10. Follow the five-step treatment model: nutrition counseling→ONS→total enteral nutrition→partial PN→total PN [10,30,32,36]. Upgrade to next level if current step cannot meet 60% of energy requirements for 3-5 days [14,32].	1a	A
	11. ONS preferred as first-line nutritional therapy after surgery [10,13,14].	5b	B
	12. Encourage oral fluid intake if no extra fluid loss; if oral intake insufficient, administer IV fluids to maintain fluid-electrolyte balance[10]. Adult maintenance fluid requirement: 30 mL/(kg·d)[24].	5b	B
Energy & protein manag ement	13. Energy targets: indirect calorimetry preferred; if unavailable, estimate at 25-30 kcal/(kg·d) [10,14,27,32]. Severe trauma or critically ill patients: 70% of target in the first week [27]. Weight calculation: normal or overweight patients: actual body weight; underweight patients: actual weight early, transition to ideal weight after stabilization; obese patients: adjusted body weight [23]. Protein: 1.2-1.5 g/(kg·d), 1.5-2.0 g/(kg·d) for severe stress [10,27].	5b	B
Feedin	14. Early oral feeding includes clear liquids, semi-liquid diet, and ONS; add ONS on the day of surgery [10,31]. For patients without	1a	A

g protoc ols	contraindications, initiate oral feeding within 24 h [8,10,13,21,22,25,26,27,30,32,34].		
	15. Day of surgery: if no choking, nausea, vomiting, abdominal distension, or dizziness during recovery, trial water intake may begin[10,26]; after recovery, start small amounts of liquid diet and ONS, gradually increase based on tolerance [10,32].	5b	B
7. Tolera nce assess ment	16. Day 1 post-op: target energy 1000 kcal, full liquid diet + ONS (rice soup, fat-free broth)[9]; ONS 50-100 mL/session [11].	1b	B
	17. Day 2 post-op: target energy 1450 kcal, liquid or soft foods + ONS (fruit juice, thin lotus root powder) [9]; ONS 100-150 mL/session [11].	1b	B
	18. Day 3 post-op: target energy 1800 kcal, semi-liquid diet + ONS (rice porridge, egg custard)[9]; ONS 150-200 mL/session, increase by 20% per meal if well-tolerated [11].	1b	B
	19. Day 4 post-op onward: gradually transition to regular diet with ONS supplementation [9].	1b	B
	20. "3+3" model recommended (3 regular meals + 3 ONS sessions)[11,14,28]. ONS daily supplement: 400-900 kcal; start with low concentration at 1/3-1/2 of standard dose (300-500 mL/day) if necessary [14,28,32].	5b	B
	21. ONS should be titrated gradually: "from thin to thick, from small to large, sip slowly"[11,32], finish within 30 minutes per session, warm to 40-50 °C [11].	5b	B
	22. Improve ONS adherence: (1) consider palatability, gastrointestinal tolerance, patient preferences, and family needs [11,28]; (2) provide preoperative nutrition education and support [32].	2b	B
	23. Immunonutrition (arginine, glutamine, ω -3 fatty acids, nucleotides) has unclear efficacy [10,22]; routine use not recommended [14,22,30]; standard intact-protein ONS is appropriate for most patients [14].	5b	B
	24. Nursing staff should post feeding plans at bedside, guide patients to follow the plan, and document actual intake, time, tolerance, first bowel movement, and reasons for unmet targets [11].	2b	B
	25. Monitor daily intestinal tolerance including patient-reported symptoms, physical examination, and gastrointestinal function assessment [27].	5b	B
	26. Increase feeding gradually from low concentration and small doses based on intestinal function recovery to improve tolerance [10,14].	5b	B
	27. Use perioperative fluid restriction, early mobilization, reduced opioid and nasogastric tube use to promote GI motility and tolerance [10,13,21,25,31].	5b	B
	28. PONV prevention: (1) low-residue diet better than clear liquid diet for reducing nausea, accelerating bowel recovery [26,31]; (2) multimodal antiemetic prophylaxis and avoiding NG tubes [13]; (3) no prophylaxis for no risk factors; 2-drug combination for 1-2 risk factors; 2-3 drugs for ≥ 3 risk factors [36]; (4) if breakthrough nausea/vomiting occurs, use different drug class for multimodal therapy [31].	5b	B

29. Diarrhea management: after excluding disease or drug causes, treat the underlying cause without stopping oral feeding; enteral nutrition-related diarrhea can be managed with short-peptide formula and probiotics; avoid sorbitol-containing products [27].	5b	B
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4. Discussion

4.1. Safety as the Precondition for Early Oral Feeding

Evidence 1-3 demonstrates that initiating oral feeding within 24 hours after colorectal surgery is safe at both the metabolic and clinical outcomes levels. Metabolically, early oral feeding provides exogenous nutritional substrates, reducing hypercatabolism and insulin resistance, and maintaining intestinal mucosal barrier integrity (Evidence 1, 2). Clinically, it reduces infection rates, shortens hospital stay, and does not increase anastomotic leakage or vomiting risk (Evidence 1, 3, 4). These findings are consistent with the Cochrane systematic review by Herbert et al [8]. and the systematic review by MacVicar et al [35]. However, safety requires dynamic assessment---clinicians should observe for choking, nausea, and other signs of acute intolerance after anesthesia recovery, and slow the feeding progression for high-risk patients to avoid a one-size-fits-all approach.

4.2. Precise Identification of Contraindications as the First Defense

Evidence 4 specifies that patients with gastrointestinal motility disorders, mesenteric ischemia, complex anastomotic leakage, intestinal fistula, abdominal infection, severe infection, shock, or severe malnutrition with intestinal wall edema should not receive early oral feeding, with PN being the priority. The ESPEN guidelines by Weimann et al. share this position [30]. However, long-term PN use carries risks of catheter-related infection and metabolic derangements [30]. Clinicians should dynamically monitor gastrointestinal function recovery and transition from PN to oral or enteral feeding as early as safely possible (Evidence 4).

4.3. Systematic Screening and Assessment as the Foundation for Stratified Management

Evidence 5-9 establishes a standardized "screening→assessment→diagnosis→intervention" pathway. NRS-2002 effectively identifies patients at nutritional risk (Evidence 7), PG-SGA is suitable for detailed assessment (Evidence 8), and GLIM criteria enable standardized malnutrition diagnosis (Evidence 9). Together, they form a complete chain of "rapid screening---precision assessment---standardized diagnosis." The Chinese Society for Parenteral and Enteral Nutrition emphasizes that screening and assessment should be repeated dynamically with changes in patient condition, not limited to a single admission assessment [27].

4.4. The Stepped-Care Principle as the Core Logic of Nutritional Therapy

Evidence 10-12 confirms that postoperative nutritional therapy for colorectal cancer should follow the "five-step" model: nutrition counseling→ONS→total enteral nutrition→partial PN→total PN. ONS has priority (Evidence 10, 11), with advancement to the next level when 60% of energy requirements cannot be met for 3-5 days (Evidence 10). Fluid management should balance oral and IV supplementation (Evidence 12). The Guangdong ERAS Society consensus similarly emphasizes the principle of "oral if possible, enteral if possible, parenteral when necessary." Clinicians should avoid using PN without attempting ONS and should adjust fluid regimens based on individual patient characteristics [32].

4.5. Precise Energy and Protein Prescription as Metabolic Support for Recovery

Evidence 13 provides a quantitative framework: energy estimated at 25-30 kcal/(kg·d), with critically ill patients receiving 70% in the first week; protein at 1.2-1.5 g/(kg·d) for routine cases, and 1.5-2.0 g/(kg·d) for severely stressed patients. The choice of weight basis directly affects calculation accuracy---use actual body weight for normal or overweight patients, adjusted weight for obese patients, and actual weight (transitioning to ideal weight after stabilization) for underweight patients (Evidence 13). Seres et al.

similarly notes that incorrect weight basis is a common cause of energy calculation errors [23].

4.6. *Stepped Feeding and ONS Management as the Clinical Implementation Pathway*

Evidence 14-24 constructs a progressive dietary pathway from postoperative day 0 to day 4 and beyond: water trial→full liquid→liquid/soft→semi-liquid→regular diet, with daily energy targets of 1000→1450→1800 kcal (Evidence 14-19). This aligns well with the ERAS guideline recommendations by Gustafsson et al [31]. ONS management uses the "3+3" model with daily supplementation of 400-900 kcal (Evidence 20), following the "from thin to thick, from small to large" principle of gradual escalation (Evidence 21). Preoperative nutrition education improves adherence (Evidence 22). Immunonutrition lacks clear clinical benefit and is not recommended for routine use (Evidence 23). The feeding plan sheet enables dynamic tracking of actual intake versus targets, preventing cumulative nutritional deficits (Evidence 24).

4.7. *Comprehensive Tolerance Management as the Safety Barrier for EOF*

Evidence 25-29 emphasizes that tolerance management requires daily symptom monitoring, dynamic feeding strategy adjustment, and supportive measures. Specific interventions include perioperative fluid restriction, early mobilization, and reducing opioid and nasogastric tube use (Evidence 27). PONV is managed with a stratified prevention approach; low-residue diet reduces nausea and accelerates intestinal recovery compared with clear liquid diet (Evidence 28). Diarrhea management should be individualized---oral feeding need not be stopped after excluding disease or drug causes; enteral nutrition-related diarrhea can be managed with short-peptide formula and probiotics (Evidence 29). The Chinese Society for Parenteral and Enteral Nutrition similarly emphasizes that tolerance assessment should be routine in postoperative nutritional management [27].

5. Summary

This study summarizes 29 pieces of best evidence across seven dimensions for early oral feeding after colorectal cancer surgery, providing systematic guidance for clinical practice. Implementation requires consideration of individual patient differences and institutional resources, dynamic safety assessment, feeding plan adjustment, and standardized tolerance risk management. Future research should focus on local validation studies to verify the applicability of this evidence across different healthcare settings, promoting deeper integration of ERAS principles with clinical practice to maximize postoperative recovery benefits for colorectal cancer patients.

Data availability statement: The data analyzed in this study is subject to the following licenses/restrictions: this study is a secondary analysis of the existing literature, original results are available from the corresponding author. Requests to access these datasets should be directed to Yuzhen JIANG, <774987319@qq.com>.

Author contributions: Yuzhen Jiang contributed to the conceptualization and design of the study, literature search, screening, quality appraisal, evidence extraction, and drafting of the initial manuscript. Jiexuan Xu contributed to literature search, screening, quality appraisal, and evidence extraction. Fan Yang and Sangu Zhang contributed to evidence extraction. Lifan Peng and Yan Xu contributed to the revision of the evidence synthesis and summary. Yuying Chen contributed to study conceptualization, quality appraisal of the literature, and review and revision of the final manuscript. All authors read and approved the final manuscript.

Funding: Kelin "Sailing and Young Seedling" Nursing Talent Cultivation Project of The First Affiliated Hospital of Sun Yat-sen University in 2024 (KLHL2024AC04)

Conflict of interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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