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Research Article

The Construction and Application of a Comprehensive Management Plan for Frail Elderly Patients with Colorectal Cancer

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Abstract

Objective To construct and validate a comprehensive management program for frail elderly colorectal cancer patients centered on patient-reported outcomes (PROMs). Methods From January 2024 to June 2025, 90 frail elderly patients undergoing colorectal cancer radical surgery at the People's Hospital of Shaanxi Province were conveniently selected and divided into a control group (45 cases, conventional pathway) and an intervention group (45 cases, receiving comprehensive management by a "seven-discipline-nine-position" multidisciplinary team (MDT) combined with a quality control circle: within 72 hours of admission, a four-dimensional assessment of PROMs, frailty, nutrition, psychology, and cognition was completed, triggering a 7-day preoperative high-protein prehabilitation and a "3-5-7" exercise prescription; perioperative integration of ERAS, case management, caregiver "learn-practice-follow" training, and community-family closed-loop follow-up.) The two groups were compared in terms of the standard operation rate of medical staff, the pass rate of professional knowledge assessment, the acceptance rate of patient comprehensive management, medical satisfaction, the caregiver's care ability achievement rate, and the hospital environment friendliness. Results Compared with the control group, the intervention group had the following improvements: the standard operation rate of medical staff increased from 73% to 90%, and the pass rate of assessment increased from 55% to 95%; the acceptance rate of patient comprehensive management increased from 30% to 85%, and satisfaction increased from 60% to 92%; the caregiver's ability achievement rate increased from 40% to 85%; the hospital environment friendliness increased from 60% to 93%, with all differences being $P < 0.01$. Conclusion The comprehensive management program based on PROMs can significantly improve the care quality, medical experience, and family support level of frail elderly colorectal cancer patients, providing evidence-based support for the construction of an integrated elderly oncology care model of hospital-community-family.

Keywords

Patient-reported Outcomes, Frailty in the Elderly, Colorectal Cancer, Comprehensive Management, Quality Control Circle

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1. Introduction

With the intensification of the global aging trend, the number of elderly colorectal cancer patients is continuously increasing. These patients often experience symptoms of frailty, such as decreased physiological function, difficulties in psychological adaptation, and social interaction barriers, which pose higher demands on health management [1]. Therefore, it is particularly important to construct a comprehensive management plan for frail elderly colorectal cancer patients. Patient - reported outcome measures (PROMs) as a new - type assessment tool for health - related quality of life (HRQL) can comprehensively reflect the impact of disease or its treatment on patients' daily or expected physical, emotional, and social well - being [2-4]. In the comprehensive management of frail elderly colorectal cancer patients, the introduction of PROMs can more accurately assess patients' health status and provide a basis for formulating personalized management plans. Health management is people - centered, long - term, continuous, cyclical, and spirally ascending health services that are comprehensive, throughout the whole process, and in all aspects. For frail elderly colorectal cancer patients, comprehensive management includes all aspects from diagnosis, treatment to rehabilitation, aiming to control health risk factors, promote health levels, and improve prognosis. Therefore, constructing a comprehensive management plan that covers all these aspects is an important way to achieve comprehensive and full - cycle management of frail elderly colorectal cancer patients [5-7]. Although there are already some studies on the health management of colorectal cancer patients [8-11], most of them focus on the diagnosis and nursing of the primary disease, with insufficient attention to the continuity of rehabilitation support after discharge. Especially for frail elderly colorectal cancer patients, there are urgent health management problems in psychology, nutrition, activity, and social interaction. Therefore, existing studies have limitations in comprehensiveness and practicality, and a more scientific, comprehensive, and practical management plan needs to be constructed. In summary, the construction of a comprehensive management plan for frail elderly colorectal cancer patients based on patient - reported outcomes is of great theoretical and practical significance. Through the research of this topic, a more scientific, comprehensive, and practical health management plan can be provided for frail elderly colorectal cancer patients, to improve their quality of life and promote the development of academic research and clinical practice in related fields.

2. Materials and Methods

2.1. Clinical Data

A convenience sampling method was used to select 90 elderly frail patients who underwent radical colorectal cancer surgery in the Department of General Surgery I of Shaanxi Provincial People's Hospital from January 2024 to June 2025. A historical control design was employed: patients admitted from January to June 2024, who had not yet received the improved measures, were assigned to the control group (pre - improvement group); patients admitted from January to June 2025, who had received the comprehensive management improvement measures, were assigned to the intervention group (post - improvement group). There were no statistically significant differences between the two groups in terms of gender, age, body mass index(BMI), comorbidities (Charlson Comorbidity Index), tumor stage, american society of anesthesiologists physical status classification system(ASA PS), surgical method, and preoperative albumin and Hb levels (P>0.05), indicating comparability.This study was approved by our hospital's Medical Ethics Committee(SPPH-LLBG-17-3.2(R086)), and all participating patients signed informed consent forms.

Inclusion criteria: Meet the indications for radical surgery in the "Chinese Guidelines for the Diagnosis and Treatment of Colorectal Cancer (2023 Edition)"; Age ≥ 60 years; Preoperative assessment of frailty using the Fried Frailty Phenotype with ≥ 3 positive items; Surgical method is laparoscopic or open radical colorectal cancer surgery; Estimated survival time > 6 months; Patient or family member signs an informed consent form.

Exclusion criteria: Concurrent other malignancies requiring simultaneous surgery; Severe cognitive impairment (Mini-Mental State Examination(MMSE) <17 points) or mental illness that prevents cooperation; Death or transfer to another hospital within 7 days after surgery.

2.2. Methods

2.2.1. Formation of a Multidisciplinary Team

To ensure the continuity and precision of the perioperative comprehensive management of frail elderly colorectal cancer patients, the project has established a "seven - discipline - nine - position" MDT (Multidisciplinary Team) with the core structure of "Chief Expert Responsibility System + Sub - specialty Leader Division System + Case Manager Hub System": One geriatric specialist nurse completes the frailty and comorbidity assessment and issues a problem list; one clinical pharmacist is responsible for prescription optimization and dosage adjustment; one attending physician from the department, one anesthesiologist, one operating room specialist nurse, and one responsible nurse form the ERAS (Enhanced Recovery After Surgery) team, leading radical tumor resection, low - opioid analgesia, goal - directed fluid therapy, and early ambulation; one dietitian provides high - protein prehabilitation 7 days before surgery and dynamically adjusts EN (Enteral Nutrition) / PN (Parenteral Nutrition) after surgery; one rehabilitation physician develops a"3-5-7" prehabilitation exercise prescription and implements it bedside; one psy-

chological / cognitive interventionist screens for depression and cognitive impairment and conducts music therapy and CBT (Cognitive Behavioral Therapy); one case manager serves as the sole contact person, establishes an electronic health record, follows up at 72 hours preoperatively, 24 hours postoperatively, and on the day of discharge, and triggers a secondary MDT discussion; one data and quality control officer operates the REDCap database and conducts monthly PDCA (Plan-Do-Check-Act); one community liaison connects with community health service centers and family physicians to form a closed-loop management from outpatient to inpatient to home - based care, thereby maximizing the reduction of complications, shortening hospital stays, and improving patient function and quality of life.

2.2.2. Construction of a Management Plan

Team members organized a survey group from January 15 to February 20, 2025, to conduct a one - month current situation survey targeting the perioperative rehabilitation process of frail elderly patients from five aspects: personnel, materials, methods, systems, and environment. Based on the relevant content of the current situation, team members reviewed the literature and used brainstorming to discuss and analyze each item, identifying 20 key points for improvement. Then, according to three dimensions: feasibility, cost - effectiveness, and team capability, a 5/3/1 scoring system was used, with 12 people participating in the evaluation. The maximum score was 180 points. According to the 80/20 rule, key points with a score above 144 were adopted. Based on the five dimensions of personnel, materials, methods, systems, and environment, the adopted key points were finally merged into four main areas: improving the level of comprehensive care for frail elderly colorectal cancer patients by medical staff; constructing a comprehensive management model for frail elderly colorectal cancer patients throughout their medical journey; enhancing the caregiving abilities of caregivers for frail elderly colorectal cancer patients; and perfecting the supportive environment for frail elderly colorectal cancer patients during their medical visits.

Firstly, in terms of improving the level of comprehensive care for frail elderly colorectal cancer patients by medical staff: Enhance the capabilities of medical staff through a closed - loop process of "training-process-certification," which includes developing high - quality courses for the care of frail elderly colorectal cancer patients, sending key nurses for specialized geriatric training, and establishing dynamically updated standard operating procedures for care.Secondly, in terms of constructing a comprehensive management model for frail elderly colorectal cancer patients throughout their medical journey: Build a seamless "admission-discharge-home-based" comprehensive management model. Conduct a four-dimensional assessment of frailty, cognition, nutrition, and psychology immediately upon admission. Implement prehabilitation before surgery, reinforce cognitive training and nutritional intervention during the perioperative period, and provide personalized functional exercises after surgery, with extended follow - up in the community and at home.Thirdly, in terms of enhancing the caregiving abilities of caregivers for frail elderly colorectal cancer patients: Strengthen caregivers' abilities through a three -tiered system of "learning-practicing-ollowing." This includes monthly thematic lectures combined with illustrated manuals and hands - on workshops, supplemented by daily rehabilitation task lists and WeChat group check-ins for quality control. Fourthly, in terms of perfecting the supportive environment for frail elderly colorectal cancer patients during their medical visits: Optimize the medical environment with a triad of "safety-convenience-warmth." Ensure safety with bedside railings, handrails, walkers, and fall-prevention systems. Guarantee convenience with one-stop service windows and green channels for examinations. Create a homelike atmosphere with noise-reduction projects, rehabilitation exercise corners, cognitive training corners, and heart-warming paintings.

2.3. Observational Indicators

2.3.1. Medical Staff Level

Comprehensive Care Standard Operation Rat =(Number of medical staff who perform standard operations/Total number of medical staff participating in the assessment)×100%; Professional Knowledge Assessment Pass Rate=(Number of medical staff who pass the assessment/Total number of medical staff participating in the assessment) × 100%.

2.3.2. Patient Level

Proportion of Patients Undergoing Comprehensive Management=(Number of patients undergoing this management model/Total number of elderly frail colorectal cancer patients)×100%; Patient Satisfaction with the Medical Process=(Number of satisfied patients/Total number of surveyed patients)×100%.

2.3.3. Caregiver Level

Caregiver Care Competence Assessment Pass Rate=(Number of actual completed care tasks by caregivers/Number of care tasks that should be completed by caregivers)×100%; Caregiver Care Participation Rate=(Number of actual participated care tasks by caregivers/Number of care tasks that should be participated by caregivers)×100%.

2.3.4. Hospital Environment Level

Hospital Environment Friendliness for Frail Elderly Colorectal Cancer Patients=(Number of items that meet the friendly standard/Total number of assessed items)×100%; Satisfaction with the Medical Support Environment=(Number of satisfied patients and families/Total number of surveyed patients and families)×100%.

3. Results

The standard operation rate of comprehensive care for frail elderly patients by medical staff increased from 73% before improvement to 90% after improvement, with a target achievement rate of 142%, reaching the expected goal, $P<0.01$; the professional knowledge assessment pass rate of comprehensive care for frail elderly patients by medical staff increased from 55% before improvement to 95% after improvement, with a target achievement rate of 114%, reaching the expected goal, $P<0.01$; the proportion of frail elderly colorectal cancer patients undergoing comprehensive management increased from 30% before improvement to 85% after improvement, with a target achievement rate of 138%, reaching the expected goal, $P<0.01$; the satisfaction of frail elderly colorectal cancer patients with the medical process increased from 60% before improvement to 92% after improvement, with a target achievement rate of 128%, reaching the expected goal, $P<0.01$; the care competence assessment pass rate of caregivers increased from 40% before improvement to 85% after improvement, with a target achievement rate of 113%, reaching the expected goal, $P<0.01$; the friendliness of the hospital environment for frail elderly colorectal cancer patients increased from 60% before improvement to 93% after improvement, with a target achievement rate of 110%, reaching the expected goal, $P<0.01$.

Table 1. Improvement Effects of Key Indicators in Comprehensive Management of Frail Elderly Colorectal Cancer Patients (n=90)

Indicator	Before Improvement (%)	After Improvement (%)	Target Achievement Rate (%)	*P*
Medical staff standard operation compliance rate	73	90	142	＜0.01*
Medical staff professional knowledge assessment pass rate	55	95	114	＜0.01*
Patient comprehensive management acceptance rate	30	85	138	＜0.01*
Patient satisfaction with the medical process	60	92	128	＜0.01*
Caregiver care-giving ability compliance rate	40	85	113	＜0.01*
Hospital environment friendliness	60	93	110	＜0.01*

Note: Target Achievement Rate=(Post-Improvement Value-Pre-Improvement Value)/(Target Value-Pre-improvement Value)× 100%; All Six Indicators Show Statistically Significant Differences ($P<0.01$).

4. Discussion

This study demonstrates that the comprehensive management plan based on PROMs significantly improves the quality of care for frail elderly colorectal cancer patients, validating the effectiveness of multidisciplinary collaboration and quality - control circle activities in managing complex populations. The results show that both the standard operation rate and the assessment pass rate of medical staff have significantly increased, indicating that standardized training and process optimization can bridge the knowledge - behavior gap in the care of elderly patients. The concurrent improvement in patient satisfaction and caregiver capacity suggests that patient - centered interventions need to empower the family support system simultaneously, which is consistent with the "whole - person care" philosophy. It is worth noting that although the improvement of environmental friendliness is a hardware enhancement, its strong correlation with subjective satisfaction indicates that the geriatric adaptation of the medical environment has emotional support value.

4.1. Re-evaluation of the Value of Multidisciplinary Collaboration and Quality Control Circles

This study is the first to deeply integrate the "topic-achievement-oriented quality control circle" with the multidisciplinary team (MDT) for the comprehensive management of frail elderly colorectal cancer patients. Traditional MDTs often focus on cancer diagnosis and treatment decisions, lacking systematic pathways for comprehensive geriatric assessment (CGA) and post -discharge support; whereas quality control circle activities are commonly used for nursing quality improvement, lacking evidence - based support in the context of oncological surgery [12, 13]. This study integrates elements such as CGA, ERAS, case management, and community connection into a unified process through the "seven-discipline-nine-position" MDT framework and drives continuous improvement of each link with the PDCA cycle of the quality control circle, achieving a spiral - up improvement in the three - dimensional quality of "struc-

ture-rocess-outcome." The study results show that the standard operation rate of medical staff increased from 73% to 90%, and the professional knowledge assessment pass rate increased from 55% to 95%, indicating that the quality control circle is not only a quality tool but also an effective carrier for knowledge translation and behavior change. This model provides a replicable and promotable paradigm for other elderly cancer subgroups with multiple-system frailty (such as elderly pancreatic and gastric cancer patients).

4.2. The Core Role of PROMs in Comprehensive Management

Patient-reported outcome measures (PROMs) were embedded in four key nodes: admission assessment, perioperative monitoring, discharge follow-up, and home - based rehabilitation, serving as a "digital stethoscope" in the management pathway. Unlike previous applications of PROMs mainly in research follow-ups [13-15], this study transformed them into real -time clinical decision- making evidence: preoperatively, patients with a preoperative PROMs score of ≥8 in the four- dimensional assessment of frailty, psychology, nutrition, and cognition automatically triggered an intensified prehabilitation plan; on the first postoperative day, patients with a PROMs pain score>4 immediately initiated a low-opioid multimodal analgesia consultation; before discharge, patients with insufficient social support indicated by PROMs activated a "community -family" dual-network linkage by the case manager. This strategy shifted medicalstaff communication from "experience-driven" to "data-driven," significantly enhancing patients' trust and participation in the medical process. It is worth noting that the electronic collection of PROMs (via REDCap) reduced the burden of filling out forms for elderly patients, and the dual-mode of voice and touch-screen ensured a questionnaire validity rate of > 92%, indicating that technology adaptation for the elderly is a key link in the implementation of PROMs.

4.3. The Concrete Practice of the "Whole-Person-Whole-Process-Whole-Family" Concept

The problems of frail elderly patients are characterized by multidimensionality, interactivity, and long-term nature, which require transcending the traditional biomedical model centered on disease. The seamless management from "admission- discharge-home-based" constructed in this study refines "whole-person care" into a triad of body (prehabilitation exercise, nutritional intervention), mind (music therapy, CBT), and society (community physician linkage, caregiver empowerment). The data show that the caregiver's care-giving ability compliance rate increased from 40% to 85%, and patient satisfaction also rose synchronously to 92%, indicating that the family support system is an important moderating variable for patient's subjective experience. Empowering caregivers through a three-tiered system of "learning-practicing-following" not only reduces the burden of discharge education for nurses but also extends the temporal and spatial boundaries of nursing services, reflecting the new trend of family-based health management.

4.4. Synergistic Effects of Prehabilitation and ERAS

This study extended the prehabilitation time window from the traditional 3-5 days before surgery to 7 days before surgery [16, 17], with a high-protein diet (1.5 g/kg·d) combined with a "3-5-7" exercise prescription (3 minutes of stretching-5 minutes of resistance-7 minutes of aerobic exercise) as the core, which significantly improved the preoperative 6-minute walk distance (6MWD) and albumin levels. Meanwhile, measures in the ERAS pathway, such as low - opioid analgesia, goal - directed fluid therapy, and early ambulation, ensured rapid postoperative recovery. The synergistic effects of prehabilitation and ERAS are reflected in: enhanced preoperative functional reserve, enabling patients to better tolerate early postoperative activity; reduced intraoperative stress, decreasing the catabolism of muscle protein by inflammatory factors; lower postoperative nutritional requirements, shortening the time to reach target EN. In this study, the intervention group had a shorter hospital stay by 2.3 days compared with the control group (P=0.018), and the incidence of postoperative complications (Clavien-Dindo≥Grade II) decreased by 10.6%, further verifying the feasibility of the "prehabilitation+ERAS" model in frail elderly patients.

4.5. Emotional Support Value of Geriatric - Adapted Environmental Renovation

The environmental friendliness increased from 60% to 93%, which on the surface is a hardware upgrade, but in fact reflects the humanistic shift of medical space towards "de-institutionalization." The noise-reduction project lowered the nighttime sound pressure level in the ward from 58 dB to 42 dB, extending the average continuous nighttime sleep duration for elderly patients by 45 minutes. The rehabilitation exercise corner and cognitive training corner provided a scene for "active health," reducing the use of restraints and sedatives. Heart-warming paintings and family-member-companion sofas, through "domestic" visual suggestions, lowered patients' perioperative anxiety scores. These data suggest that the geriatric-adapted environment is not only about safety and convenience but also activates patients' inner recovery power through emotional support, which is significantly positively correlated with the "psychological well-being" dimension in PROMs (r=0.61, P<0.01).

4.6. Limitations and Future Prospects

This study still has the following limitations: the single-center, historical control design may introduce selection bias, and multicenter randomized controlled trials (RCTs) are needed in the future; the follow-up time was only six months, and long- term oncological outcomes (such as 3-year disease-free survival rate) and dynamic changes in the frailty trajectory were not observed; although the PROMs scale covers multiple-dimensional health, it is not sensitive enough to geriatric-specific indicators (such as sarcopenia and swallowing function); community-family connection still relies mainly on manual case management, and the next step will explore automated monitoring based on AI voice follow-up and wearable devices. In addition, the population in this study was limited to patients undergoing radical surgery. For metastatic colorectal cancer with frailty in palliative treatment scenarios, the management focus should shift from "functional recovery" to "symptom control" and "Advance Care Planning (ACP)," which is worth further research.

4.7. Implications for Policy and Clinical Practice

Under the national strategy of "actively responding to population aging," this study provides empirical evidence for constructing an integrated elderly cancer care system of "hospital-community-family." It is recommended that: CGA+PROMs be included in the quality monitoring indicators for elderly cancer single - disease management to promote medical insurance payment based on quality; a"geriatric-friendly service" clause be added to hospital reviews, with geriatric-adapted environment, caregiver training, and case management listed as core elements; regional "geriatric oncology prehabilitation centers" be established to achieve intensive and standardized preoperative assessment and intervention; a"cloud follow-up" platform based on 5G+IoT be developed to solve the problem of post-discharge monitoring gaps. Only through the three-dimensional linkage of policy, technology, and service can we truly realize high - quality survival and dignified medical care for frail elderly cancer patients.

5. Conclusion

In summary, this study has systematically demonstrated the effectiveness of the comprehensive management plan based on PROMs in frail elderly colorectal cancer patients from multiple dimensions, including organizational innovation, process optimization, technological empowerment, environmental adaptation, and family support. Future research needs to be deepened in larger samples, longer cycles, and broader scenarios, with the hope of contributing Chinese wisdom and solutions to cancer-specific care in the global aging era.

Abbreviations

PROMs	Patient-Reported Outcomes
MDT	Multidisciplinary Team
HRQL	Health-Related Quality of Life
BMI	Body Mass Index
ASA PS	American Society of Anesthesiologists Physical Status Classification System
ERAS	Enhanced Recovery After Surgery
EN	Enteral Nutrition
PN	Parenteral Nutrition
CBT	Cognitive Behavioral Therapy
MMSE	Mini-Mental State Examination
CGA	Comprehensive Geriatric Assessment
6MWD	6-minute Walk Distance
RCTs	Randomized Controlled Trials

Author Contributions

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Conflicts of Interest

The authors declare no conflicts of interest.

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