Postprint: Impact of an Integrated Hospital-Community-Patient Chronic Disease Management Pathway on Postoperative Colorectal Cancer Patients

Authors: Yang Sen, Zhao Huaxin, Ge Xuhua, Ma Le, golden flower, Xie Mujin, Pu Zhen, Bai Zhaohui, Yu Dehua, 于德华

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Abstract

Background: Surgery is one of the primary treatment modalities for colorectal cancer. However, postoperative colorectal cancer patients must confront numerous physical and psychological issues, which severely impact treatment outcomes and quality of life. Therefore, effective postoperative management is extremely important.

Objective: This study primarily investigated the effectiveness of the hospital-community-patient integrated chronic disease management pathway intervention in postoperative colorectal cancer patients.

Methods: Based on different postoperative intervention modalities, colorectal cancer patients were divided into a control group (n=40) and an integrated management group (n=36). The control group received conventional postoperative intervention, while the integrated management group followed the constructed integrated chronic disease management pathway for combined management. Changes in preoperative and postoperative laboratory indicators, recurrence and metastasis, mortality, postoperative complications, quality of life, and anxiety status were compared between the two groups.

Results: At 3 months and 6 months postoperatively, carcinoembryonic antigen levels in the integrated management group were lower than those in the control group (1.4 ng/mL vs. 3.2 ng/mL, 2=-4.653, P<0.001; 2.6 ng/mL vs. 3.8 ng/mL, 2=-3.634, P<0.001); At 3 months postoperatively, the recurrence and metastasis rate in the integrated management group showed no significant difference from the control group (P>0.05), while at 6 months postoperatively, the recurrence and metastasis rate in the integrated management group was lower than that in the control group (5.6% vs. 22.5%, 2=4.395, P=0.036); Furthermore, at

3 months and 6 months postoperatively, the complication rate in the integrated management group was lower than that in the control group (0 vs. 16.2%, 2=3.981, P=0.046; 5.6% vs. 25.0%, 2=5.388, P=0.020). However, there was no significant difference in mortality at 6 months postoperatively between the two groups (2.8% vs. 7.5%, 2=0.165, P=0.685). In terms of quality of life scores at 6 months and 1 year postoperatively, the integrated management group was higher than the control group [(48.74$±2.16)*pointsvs.*(44.73±3.41)*points*, $t = -5.922, P < 0.001$; (42.03±1.94)*pointsvs.*(36.98±4.65)*points*, $t = -5.952, P < 0.001$], *andinanxietyscores*, *theintegratedmanagementgroupwaslowerthanthecontrolgroup*[(60.12±6.23)*poin* 2.650, $P = 0.010$; (66.49±5.67)*pointsvs.*(72.41±$5.25) points, t=4.600, P<0.001].

Conclusion: The hospital-community-patient integrated chronic disease management pathway can reduce postoperative complications in colorectal cancer patients, decrease cancer recurrence and metastasis, improve quality of life, and ameliorate anxiety symptoms, holding important value for the prognosis of postoperative colorectal cancer patients.

Full Text

Introduction

Surgery is one of the primary treatment modalities for colorectal cancer. With continuous advancements in surgical techniques, an increasing number of patients can receive effective treatment. However, during postoperative management, patients must confront numerous physical and psychological challenges, including recurrence, metastasis, pain, nausea, diarrhea, malnutrition, anxiety, and depression [1-3]. These issues undoubtedly affect treatment outcomes and quality of life for colorectal cancer patients, making effective postoperative management a focal point of medical attention. Although numerous studies have investigated postoperative management strategies for colorectal cancer patients —such as the application of probiotic preparations in pharmacological therapy, which can regulate intestinal microecological balance and reduce infection rates and inflammatory responses [4]; nutritional support interventions that prevent malnutrition, promote wound healing, and enhance immunity [5]; psychological interventions targeting anxiety and depression that help alleviate physical discomfort and facilitate recovery [6-7]; and perioperative prophylactic antibiotics and deep vein thrombosis prevention that reduce surgical complication rates [8] —these measures, while beneficial, require a comprehensive, systematic intervention protocol to achieve optimal results. This necessitates the joint participation of hospitals, communities, and patients. Therefore, this study established a complete integrated hospital-community-patient chronic disease management pathway for postoperative colorectal cancer patients based on three levels: hospital, community, and patient. This pathway aims to provide more comprehensive and precise management, improve patients' quality of life and prognostic outcomes, and offer an important reference for clinical practice in postoperative

management of other tumor diseases.

Methods

1.1 General Information

This study was a retrospective cohort study. We selected 80 postoperative colorectal cancer patients discharged from the Department of General Surgery at Yangpu Hospital affiliated with Tongji University between January 2021 and April 2022. During follow-up, 2 patients had incomplete information and 2 were lost to follow-up; these cases were excluded. The final cohort comprised 76 patients with an effective follow-up rate of 95.0%. Based on different postoperative management models, patients were divided into two groups: a control group (n=40) and a co-management group (n=36). All patients were younger than 85 years. Basic demographic information is detailed in Table 1 . This study complied with the principles of the Helsinki Declaration, and all patients voluntarily provided informed consent.

1.2 Inclusion and Exclusion Criteria

Inclusion criteria: (1) Pathologically confirmed colorectal cancer; (2) Underwent surgical treatment for colorectal cancer; (3) Age between 18 and 85 years; (4) Complete medical records and follow-up data; (5) Patients with stable control of chronic diseases other than cancer.

Exclusion criteria: (1) History of mental illness or cognitive impairment that precluded normal communication; (2) History of other malignancies; (3) Patients with other serious diseases; (4) Patients lost to follow-up after surgery.

1.3 Observation Indicators

(1) Comparison of clinical characteristics and laboratory indices between the two groups. (2) Recurrence, metastasis, mortality, and complication rates in both groups. (3) Quality of life was assessed using the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 version 3.0 (EORTC QLQ-C30) Chinese version, developed by the European Organization for Research and Treatment of Cancer. This questionnaire comprises 30 items covering 15 domains, including 5 functional domains, 1 global health/quality of life domain, and 9 symptom domains. In this study, the "global health/quality of life domain"was selected to evaluate quality of life before and after surgery. Higher scores indicate better functional status and quality of life. The scale has demonstrated good reliability, validity, and sensitivity and is suitable for Chinese cancer patients [9-10]. (4) Psychological status was evaluated using the Self-Rating Anxiety Scale (SAS) to assess anxiety levels before and after surgery in both groups. Developed in 1971, the SAS effectively reflects subjective experiences of patients with anxiety tendencies and can evaluate the severity of

anxiety symptoms and changes during treatment. According to SAS standard score cutoffs: 50-59 indicates mild anxiety, 60-69 moderate anxiety, and >69 severe anxiety. Higher scores indicate more severe anxiety [11].

1.4 Follow-up

All patients began follow-up after discharge, with regular assessments conducted at 3 months, 6 months, and 1 year postoperatively through outpatient visits, telephone calls, or WeChat communications. Relevant laboratory indices and disease progression were recorded at each follow-up.

1.5 Intervention Methods

Patients in the control group received conventional postoperative management, following medical advice to attend regular follow-up appointments and receive medical care at the hospital without any active postoperative intervention from the management team. Follow-up content included: (1) regular monitoring of vital signs and physical condition; (2) regular endoscopic and/or imaging examinations to detect cancer recurrence or metastasis; and (3) for patients receiving chemotherapy, regular blood biochemical tests and electrocardiograms.

Patients in the co-management group received comprehensive integrated hospital-community-patient chronic disease management intervention. This approach established a collaborative mechanism among hospitals, communities, and patients throughout the treatment process, aiming to improve treatment efficacy and reduce recurrence and mortality rates through standardized, systematic, and scientific management. Specifically, this management model included three phases: (1) **Hospital phase:** Focused on surgical treatment, chemotherapy regimen planning, postoperative complication prevention, and physical recovery to ensure rapid postoperative rehabilitation. (2) **Community phase:** After discharge, community follow-up, medication supervision, and rehabilitation support were led by general practitioners with participation from community nurses. Pain management and chemotherapy administration were primarily directed by the attending physician team, with effective collaboration with community general practitioners to ensure appropriate interventions and timely referral when needed. Specific components included: 1) **Follow-up:** General practitioners developed detailed follow-up plans based on individual patient conditions, including timing, methods, and content, with regular documentation of physical status and treatment progress to facilitate communication with specialists for treatment adjustment. 2) **Pain management:** The attending physician team developed pain management protocols based on severity, with general practitioners guiding medication use and monitoring pain levels, providing timely feedback to the attending team. 3) **Chemotherapy management:** The attending physician team monitored chemotherapy progress and patient responses, while general practitioners provided emotional support and psychological counseling to help patients cope with treatment-related stress. 4) **Medication supervision:** General

practitioners strictly monitored medication adherence, tracked therapeutic effects and adverse reactions, and provided targeted medication education. 5) **Rehabilitation support:** General practitioners developed appropriate rehabilitation plans based on patients' physical conditions and needs, monitored progress, and provided guidance to restore physical function and improve quality of life. (3) **Patient self-management phase:** Patients actively participated in managing their own conditions, including self-monitoring, healthy lifestyle adoption, psychological support, nutritional counseling, family support, and rehabilitation exercise to better understand their disease and facilitate recovery. Throughout the postoperative management process, community general practitioners could communicate with attending physicians via telephone, WeChat, or video conferences for feedback and information sharing. This integrated hospital-community-patient approach enables rational resource allocation, information sharing, improved patient satisfaction and treatment efficacy, and establishes a stable medical service system providing comprehensive, efficient, and convenient care. The specific workflow is detailed in Figure 1 [Figure 1: see original paper].

1.6 Statistical Methods

Statistical analysis was performed using SPSS 27.0 software. General patient information, recurrence/metastasis rates, and complication rates were expressed as frequencies and percentages [n (%)] and compared using the ^{2} test. Laboratory indices and age were expressed as medians with interquartile ranges [M(P25, P75)] and compared using the rank-sum test. Quality of life and SAS scores were expressed as means ± standard deviations ($\bar{x}\pm s$). Within-group comparisons across different time points were performed using analysis of variance, with pairwise comparisons conducted using LSD-t tests. Independent samples were compared using t-tests. The significance level was set at two-sided α=0.05.

Results

2.1 Comparison of General Patient Information

This study compared general clinical data between the two groups before surgery, including sex, age, lesion location, tumor stage, and pathological type. The results showed no statistically significant differences between the groups (P>0.05), indicating comparability. Details are provided in Table 1.

2.2 Comparison of Preoperative Laboratory Indices

Preoperative laboratory indices were compared between the two groups, including complete blood count, liver and kidney function, serum carcinoembryonic antigen (CEA), carbohydrate antigen 199 (CA199), carbohydrate antigen 125 (CA125), and carbohydrate antigen 724 (CA724). The results showed no statistically significant differences in these laboratory indices between the groups (P>0.05). Details are provided in Table 2 .

2.3 Laboratory Results and Disease Outcomes at 3 Months Postoperatively

At 3 months postoperatively, 3 patients in the control group experienced recurrence or metastasis compared to 1 patient in the co-management group, though this difference was not statistically significant (P>0.05). Additionally, 6 patients in the control group developed postoperative complications (including 2 wound infections, 1 anastomotic leak, 2 intestinal obstructions, and 1 case of ascites), while no patients in the co-management group experienced complications, representing a statistically significant difference (P<0.05). There were no deaths in either group. Furthermore, CEA levels differed significantly between the groups (P<0.05), while other laboratory indices showed no significant differences (P>0.05). Details are provided in Table 3 .

2.4 Laboratory Results and Disease Outcomes at 6 Months Postoperatively

At 6 months postoperatively, disease outcomes showed that 9 patients in the control group experienced recurrence or metastasis compared to 2 patients in the co-management group. Ten patients in the control group developed complications (including 2 intra-abdominal infections, 2 intestinal obstructions, 3 deep vein thromboses, 2 cases of diarrhea, and 1 case of ascites), while 2 patients in the co-management group developed complications (1 deep vein thrombosis and 1 intestinal obstruction). Both differences were statistically significant (P<0.05). Regarding mortality, 3 deaths occurred in the control group and 1 in the co-management group (all due to intestinal tumors), with no statistically significant difference (P>0.05). Additionally, CEA levels were significantly lower in the co-management group compared to the control group (P<0.05), while other laboratory indices showed no significant differences (P>0.05). Details are provided in Table 4 .

2.5 Comparison of Quality of Life and SAS Scores Before and After Surgery

No statistically significant differences were observed in EORTC QLQ-C30 or SAS scores between the two groups before surgery (P>0.05). However, at 6 months and 1 year postoperatively, the co-management group demonstrated significantly higher EORTC QLQ-C30 scores (P<0.05) and significantly lower SAS scores compared to the control group (P<0.05). Moreover, both groups showed gradual decreases in EORTC QLQ-C30 scores and gradual increases in SAS scores over time at 6 months and 1 year postoperatively, with statistically significant differences (P<0.05). Details are provided in Table 5 .

Discussion

Postoperative management of colorectal cancer patients is currently a hot topic in clinical research. Numerous domestic and international studies have explored

various postoperative management strategies, including pharmacological therapy, nutritional support, psychological intervention, and rehabilitation training [12-15]. In this study, we established an integrated chronic disease management pathway for postoperative colorectal cancer patients centered on patient needs and based on collaboration between secondary/tertiary hospitals and community medical teams, implementing comprehensive health management measures. Our results demonstrate that this management pathway effectively improves postoperative quality of life, reduces recurrence and metastasis, decreases complications, and alleviates anxiety.

CEA is a glycoprotein that is significantly elevated in certain malignancies such as colorectal cancer, gastric cancer, and lung cancer, making it widely used for tumor diagnosis, treatment monitoring, and detection of recurrence and metastasis [16]. In this study, CEA levels and complication rates in the co-management group were lower than those in the control group at both 3 and 6 months postoperatively. Furthermore, the tumor recurrence/metastasis rate in the co-management group was significantly lower than in the control group at 6 months postoperatively. This may be attributed to the integrated chronic disease management pathway, which included chemotherapy management, medication supervision, and complication prevention, thereby enhancing patients' immune function and physical resistance to reduce risks of tumor recurrence, metastasis, and postoperative complications. Compared with previous studies, this integrated management pathway is more comprehensive and patient-centered [17]. Additionally, unlike earlier approaches [18], our pathway was adjusted and optimized according to individual patient needs, thereby improving intervention effectiveness and clinical applicability. Although both groups experienced mortality at 6 months postoperatively, the difference was not significant, warranting further investigation of long-term outcomes. Based on these results, we recommend that postoperative management of colorectal cancer patients should consider individualized needs and clinical circumstances, adopting an integrated chronic disease management pathway to maximize the positive roles of secondary/tertiary hospitals and community medical teams in patient recovery and improve prognostic outcomes.

The EORTC QLQ-C30 is widely used to assess quality of life and health status in cancer patients, guiding clinical decision-making and prognosis prediction [9]. This study showed that quality of life scores were higher in the co-management group, likely due to the additional postoperative rehabilitation support and medication guidance provided. In contrast, the control group received only conventional medical follow-up. Furthermore, co-management group patients may have benefited from enhanced communication and information sharing, enabling secondary/tertiary hospital physicians to monitor disease changes promptly for optimal treatment outcomes. The study also demonstrated that SAS scores were lower in the co-management group, possibly related to better pain management and rehabilitation support, which positively impact psychological status. Additionally, co-management group patients demonstrated greater health awareness and more active participation in treatment, further contributing to improved

psychological well-being. Previous studies have highlighted the importance of psychological intervention in postoperative recovery for patients with lung cancer, brain tumors, and rectal cancer [19-21], consistent with our findings. Therefore, our results further validate the importance of psychological intervention in postoperative recovery for cancer patients. Future research should explore the impact of psychological support on quality of life in tumor patients and how to better implement psychological interventions in clinical practice to help patients cope with postoperative physical and psychological challenges.

Despite these positive findings, several limitations warrant further exploration. First, the sample size was limited, requiring expansion to ensure representativeness. Second, this study did not conduct multi-dimensional evaluations of the integrated pathway from the perspectives of patients, families, specialists, and general practitioners, representing an important direction for future research. Finally, most enrolled patients had comorbid chronic diseases, and although these conditions were stable, the study did not include specific data such as blood pressure, blood glucose, lipid levels, or cardiopulmonary function staging, which may introduce bias. Therefore, our future work will explore how different stages and grades of chronic diseases affect postoperative tumor patients and identify personalized management strategies suitable for patients with various chronic conditions.

In conclusion, the integrated hospital-community-patient chronic disease management pathway for postoperative colorectal cancer patients is a relatively effective and feasible strategy that can significantly improve treatment outcomes and quality of life. These results hold important significance and value for the rehabilitation and prognosis of postoperative colorectal cancer patients and provide new insights for exploring chronic disease management in oncology.

Author Contributions

YANG Sen, YU Dehua, and GE Xuhua proposed the main research objectives and were responsible for study conception and design. YANG Sen was responsible for study implementation and manuscript writing. ZHAO Huaxin, MA Le, JIN Hua, XIE Mujin, PU Zhen, and BAI Zhaohui collected and organized data, performed statistical analysis, and prepared figures and tables. YANG Sen revised the manuscript. YU Dehua was responsible for quality control and review, overall article responsibility, and supervision.

Conflicts of Interest: The authors declare no conflicts of interest.

ORCID IDs: - YANG Sen: https://orcid.org/0000-0001-6822-5095 - YU Dehua: https://orcid.org/0000-0001-7652-938X

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Note: Figure translations are in progress. See original paper for figures.