

Nursing intervention timing and symptom evolution of low anterior resection syndrome in patients with middle and low rectal cancer after sphincter-preserving surgery

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Abstract

Objective

To explore the symptom experiences and needs of patients with low anterior resection syndrome (LARS) and their caregivers after sphincter-preserving surgery for rectal cancer, clarify the temporal evolution pattern of symptoms and the optimal nursing intervention timing, identify relevant influencing factors, and provide evidence for precise clinical nursing.

Methods

A mixed-methods design was used. The qualitative phase employed a phenomenological approach with semi-structured interviews of 15 LARS patients and 15 family caregivers at a tertiary hospital in Anhui Province (February–May 2024), analyzed via Colaizzi's seven-step method. The quantitative phase enrolled 168 patients undergoing sphincter-preserving surgery at the same hospital (June 2024–June 2025), with follow-ups at discharge (T0), 2 weeks (T1), 1 month (T2), 3 months (T3), and 6 months (T4) post-surgery using the LARS score, Social Support Rating Scale (SSRS), and Intestinal Symptom Self-Management Behavior Questionnaire. Statistical methods included descriptive statistics, repeated-measures ANOVA, and univariate analyses.

Results

The qualitative study identified three themes: (1) binary interaction and empathy dilemmas of symptom stress, including perception differences and emotional transmission; (2) binary collaboration and conflict in coping strategies; and (3) binary imbalance and complementarity of support needs. Quantitatively, the overall LARS incidence was 77.38%. Symptom evolution was dynamic: T1 had the highest incidence and the highest proportion of severe symptoms (29.76%), with symptoms gradually alleviating over time—by T4, 92.26% of patients had mild or no symptoms. T1 was the symptom peak (LARS score 24.470 ± 9.656), significantly higher than at other time points ($p < 0.01$); at this node, self-management ability was low (25.655 ± 8.917), and social support utilization was only 4.107 ± 2.805 .

Conclusion

LARS incidence is high and dynamically evolves after sphincter-preserving surgery, with 2 weeks post-surgery identified as the critical intervention time node. Clinicians should address cognitive differences and dyadic coping needs, establish family-centered continuous nursing support, enhance self-management, and strengthen social support to improve rehabilitation outcomes and quality of life.

Introduction

Middle and low rectal cancer is the predominant type of rectal cancer in China, with a median onset age of approximately 45 years and a trend toward younger age[1]. It typically develops from adenomatous polyps over 5–10 years[2]. Transabdominal low anterior resection combined with sphincter-preserving techniques is the standard surgical approach, aiming to maximize tumor control while preserving anal function and avoiding permanent stoma-related psychosocial distress[3].

However, sphincter preservation does not mean normal bowel function. Due to reduced afferent nerves, pelvic nerve and sphincter injury, and decreased rectal capacity and compliance, most patients develop low anterior resection syndrome (LARS), manifesting as frequent defecation, urgency, evacuation disorders, and incontinence. These symptoms create “toilet dependence,” physical fatigue, psychological burden, and social disruption, becoming a core issue affecting long-term quality of life[4].

Although existing studies recognize the severe impact of LARS on quality of life, most are cross-sectional and cannot reveal dynamic postoperative changes[5]. Nor do they identify when symptoms worsen or alleviate, leaving the optimal intervention timing and stage-specific priorities without empirical support. Early post-discharge transition from hospital to home, when bowel dysfunction emerges without professional guidance, may be a critical sensitive period, but this hypothesis lacks longitudinal validation. Therefore, longitudinal trajectory research is urgently needed to delineate LARS evolution, identify peak and turning points, and determine the sensitive window for nursing intervention, thereby providing a scientific basis for staged, precise nursing strategies to improve bowel recovery and long-term quality of life.

Background

The Symptom Management Dynamic Model, developed by Brant et al. in 2010, integrates four theoretical frameworks (Symptom Management Theory, Theory of Unpleasant Symptoms, Symptom Experience Model, and Temporal Experience Model of Symptoms) and incorporates the time dimension[6]. It comprises five dimensions: influencing factors, symptom experience, symptom change trajectory, intervention strategies, and outcomes. Its core innovation is expanding assessment from static single-point to longitudinal dynamic tracking, capturing peak amplitude, fluctuation, and duration, thereby reflecting the nonlinear, fluctuating nature of symptom changes. The model emphasizes the subjectivity of “symptom experience”—patients’ and caregivers’ perception, meaning-making, and emotional responses—and requires objective evolution patterns via longitudinal data, forming a complete cognitive chain from subjective experience to objective trajectory.

Current studies on LARS after sphincter-preserving surgery are mostly cross-sectional, lacking qualitative depth and dynamic trajectory tracking[7]. Evidence from both patient experience and longitudinal data is insufficient regarding when symptoms peak, stabilize, or become amenable to intervention. Therefore, this study used a mixed-methods approach: Phase I (qualitative phenomenological interviews) explored symptom experiences, coping difficulties, and support needs of patients and caregivers, providing real-world foundations for Phase II. Phase II used a longitudinal design guided by the Symptom Management Dynamic Model to track LARS trajectories at five postoperative time points, identifying the peak period and optimal intervention window. The two phases complement each other to provide scientific evidence for staged, precise nursing interventions based on symptom trajectories and patient-centered experience, ultimately improving bowel function recovery and quality of life.

Methods

Aims

To determine the optimal nursing intervention timing for LARS after rectal cancer surgery, this study first used qualitative research to explore the real experiences and needs of patients and caregivers, then employed longitudinal surveys to delineate symptom evolution at five time points within 6 months post-surgery, and finally analyzed changes in symptoms, social support, and self-management across stages to provide theoretical guidance for developing staged, precise nursing strategies.

Study Population

Qualitative study: A phenomenological design with a mixed convenience-purposive sampling strategy was used. From February 2024 to May 2025, 15 LARS patients and 15 family caregivers were recruited from a tertiary hospital in Anhui Province. Patients were diagnosed according to the 2023 Chinese Protocol for Diagnosis and Treatment of Colorectal Cancer and underwent sphincter-preserving surgery. Inclusion criteria: normal preoperative anal function without ulcerative colitis, irritable bowel syndrome, or Crohn's disease; preserved anal sphincter without severe anastomotic leakage or fistula; age ≥ 45 years; LARS score ≥ 21 with symptoms ≥ 2 weeks; able to take food orally; and having a fixed family caregiver. Exclusion criteria: cognitive/mental disorders, postoperative use of medications affecting bowel function, inability to communicate verbally, or intolerance/severe complications at interview. Caregiver inclusion: age ≥ 18 years; primary caregiver involved in care decisions; daily care ≥ 3 hours for ≥ 7 cumulative days; informed consent. Those with cognitive/mental disorders or inability to communicate were excluded. Sample size was determined by information saturation, achieved when no new themes emerged, yielding 15 patients (P1–P15) and 15 caregivers (C1–C15).

Quantitative study: Patients undergoing sphincter-preserving surgery for rectal cancer at the same tertiary hospital from June 2024 to June 2025 were enrolled. Follow-ups were conducted at T0 (discharge), T1 (2 weeks), T2 (1 month), T3 (3 months), and T4 (6 months) via on-site, online, or telephone surveys. Based on 25 variables (17 from general information, 1 from LARS, 4 from self-management, 3 from SSRS), the required sample size was 5–10 times the variable count. Considering a 10% attrition rate, the minimum was 138; 168 patients were ultimately enrolled. Inclusion: age ≥ 45 years; pathologically confirmed rectal cancer with radical sphincter-preserving surgery; normal preoperative anal function without ulcerative colitis, irritable bowel syndrome, or Crohn's disease; clear consciousness and communication ability; smooth discharge within 3–5 days; ability to eat orally and use anal function; voluntary informed consent. Exclusion: tumor recurrence/metastasis; severe systemic diseases; postoperative use of medications affecting bowel function or secondary severe complications; permanent stoma. Those who died or were lost to follow-up were excluded. All participants provided written informed consent, and the hospital ethics committee approved the study (2024LL023).

Research Methods

Qualitative methods: A semi-structured interview guide was developed through literature review and group discussion, refined after pilot interviews with two LARS patients and their caregivers. Formal interviews (Table 1) were conducted one-on-one in a quiet, private setting, audio-recorded, and transcribed within 24 hours by two individuals familiar with the local dialect. Data were managed with NVivo 20 and analyzed using Colaizzi's seven-step method, including repeated reading, coding, categorization, theme condensation, and member checking[8]. Researchers suspended personal biases; disagreements were resolved by team discussion. Purposive sampling enhanced diversity based on income, care duration, and LARS duration to improve representativeness.

Table 1
Interview outlines for LARS patients and caregivers

Patients	Caregivers
1. How much do you know about LARS symptoms?	2. How much do you know about the LARS symptoms experienced by the patient?
3. How do you feel after developing LARS?	4. How do you feel about the patient's LARS symptoms? Can you cope with them? How do you cope?
5. What do you feel is the biggest challenge to your life after symptom onset?	6. What impact do you think the patient's LARS symptoms have had on his/her life and yours?
7. What impact have LARS symptoms had on you and the person caring for you?	8. What is the biggest challenge you face while caring for the patient?
9. How do you cope when symptoms appear? Have you received help? What further help would you like to receive?	10. Is there anything else you would like to add?
11. Is there anything else you would like to add?	

Quantitative methods: Four instruments were used: (1) a self-developed general information questionnaire covering demographic and disease-related data; (2) the LARS score questionnaire (5 items, total 0–42, classified as no LARS 0–20, mild 21–29, severe 30–42; sensitivity 93.8%, specificity 76.7%)[9]; (3) the Intestinal Symptom Self-Management Behavior Questionnaire (5 dimensions, 20 items, adoption frequency 0–4, effectiveness 0–3, total 0–80, I-CVI 0.80–1.00, Cronbach's α 0.781)[10]; and (4) the Social Support Rating Scale (10 items, 3 dimensions, total 12–66, Cronbach's α 0.847)[11]. Data were collected at five time points via face-to-face, telephone, or online surveys. Quality control included trained investigators, standardized instructions, timely verification, dual data entry, and multiple contact methods to minimize attrition.

Statistical Analysis

SPSS 26.0 was used, with a two-sided $\alpha = 0.05$ significance level. Count data were described as frequencies and percentages, with between-group comparisons using χ^2 or Fisher's exact tests. Normally distributed measurement data were expressed as mean $\pm$ SD, with between-group comparisons using independent t-tests. Longitudinal changes in LARS scores were visualized with line graphs and analyzed using repeated-measures ANOVA with Bonferroni post-hoc tests. The time node with the highest mean score, significantly exceeding all others, was identified as the symptom peak.

Results

General information for the 15 pairs of LARS patients and their caregivers is presented in **Table 2**. Through collection, coding, and analysis of interview data from LARS patients and caregivers, three themes were extracted:

- (1) Binary interaction and empathy dilemmas of symptom stress, including symptom perception differences and empathy barriers, and interactive transmission of stress emotions;
- (2) Binary collaboration and conflict in coping strategies, including positive effects of collaborative coping, and conflict and compromise in coping strategies;
- (3) Binary imbalance and complementarity of support needs, including emotional support imbalance, and complementarity and limitations of external support.

Theme summaries are detailed in **Table 3**.

Table 2 Basic information of interview participants

Patient number	Age (years)	Gender	Marital Status	Monthly per capita household income (¥)	LARS score	Duration of LARS Diagnosis (months)	Caregiver number	Age (years)	Gender	Relationship	Duration of Post-LARS (months)
P1	>60	Male	Married	3000-5000	Severe	2	C1	>60	Male	Spouse	2
P2	>60	Male	widowed	<3000	Severe	3	C2	<45	Male	Mother and Daughter	3
P3	45-60	Female	Married	<3000	Mild	6	C3	<45	Female	Mother and Daughter	6
P4	45-60	Female	Married	3000-5000	Severe	1.5	C4	<45	Male	Mother and Daughter	1
P5	>60	Male	Married	3000-5000	Severe	3	C5	<45	Male	Mother-in-Law and Daughter-in-Law	1.5
P6	>60	Female	Married	<3000	Severe	2	C6	45-60	Male	Mother and Daughter	1.5
P7	45-60	Male	Married	3000-5000	Mild	2	C7	45-60	Female	Spouse	2
P8	>60	Male	widowed	<3000	Severe	0.5	C8	<45	Male	Mother and Daughter	0.5
P9	>60	Female	Married	>5000	Severe	0.5	C9	>60	Male	Spouse	0.5
P10	45-60	Female	Married	3000-5000	Severe	1.5	C10	45-60	Male	Spouse	1.5
P11	>60	Female	Married	3000-5000	Severe	2	C11	>60	Male	Spouse	2
P12	>60	Male	widowed	3000-5000	Severe	1	C12	>60	Male	Mother and Daughter	1.5
P13	45-60	Female	Married	>5000	Mild	1.5	C13	>60	Male	Spouse	1.5
P14	>60	Female	Married	3000-5000	Severe	4	C14	>60	Male	Spouse	4
P15	45-60	Male	Married	3000-5000	Severe	1	C15	45-60	Female	Spouse	1

Table 3 Themes of LARS symptom care status and needs

Theme	Sub-themes
Binary interaction and empathy dilemmas of symptom stress	1. Symptom perception differences and empathy barriers 2. Interactive transmission of stress emotions
Binary collaboration and conflict in coping strategies	1. Positive effects of collaborative coping 2. Conflict and compromise in coping strategies
Binary imbalance and complementarity of support needs	1. Emotional support imbalance 2. Complementarity and limitations of external support

Binary Interaction and Empathy Dilemmas of Symptom Stress

1. Symptom Perception Differences and Empathy Barriers

Patients and their caregivers showed significant divergence in LARS symptom perception: patients generally lacked understanding of symptom presentation and mechanisms, tending to attribute symptoms to "treatment failure" or "irreversible outcomes," while caregivers focused more on the changing trends of symptoms with disease progression, generating persistent concerns and uncertainty. This cognitive misalignment directly led to mutual empathy obstruction and communication difficulties, further weakening the effectiveness of the family support system.

C4: "He hasn't spoken, hasn't eaten, or drunk since coming back from the hospital. No matter what you say to him, he ignores you. I got anxious with my mom and called relatives to help persuade him, but he's stubborn. Who knows how long this will last!"

P4: "What's the use of telling them [the family caregivers]? This can't be cured for sure. It's useless to tell the doctor either, so I just don't talk."

P7: "My husband says I'm not obedient, but I feel this just won't get better."

C14: "I said, 'Let's go see the doctor. This symptom is still quite serious, and who knows how long it will last.' He said it's nothing and that I'm worrying too much."

2. Interactive Transmission of Stress Emotions

Patients' negative emotions (such as anxiety, helplessness, and despair) and caregivers' stress responses intertwine and mutually amplify, forming a vicious cycle of emotional transmission. This cycle not only exacerbates patients' psychological distress but also significantly weakens caregivers' caregiving resilience, suggesting that symptom management must incorporate binary emotional synchronous assessment.

C4: "My dad hasn't spoken since coming home, can't sleep, just lies in bed, doesn't eat, doesn't drink, doesn't talk. Our whole family is anxious. How can we sleep well!"

P15: "Can't sleep all night, just having bowel movements—black watery stools, watery stools. I feel like I'm about to die [pause and stare blankly]. Basically, I spent this whole Spring Festival sitting on the toilet. You know, I feel worse than death. I wish I hadn't had surgery. I wish I had just died!"

C15: "You say she's like this all night, we're also very annoyed. And she's talking about dying, which makes us collapse too."

Binary Collaboration and Conflict in Coping Strategies

1. Positive Effects of Collaborative Coping

Collaborative coping patterns formed by patients and caregivers through facing challenges together, emotional support, and attention diversion can effectively alleviate the psychological burden of symptoms and enhance both parties' coping confidence. This positive effect has a significant protective role in the postoperative recovery process.

C2: "Look at me, I'm cheerful now. After surgery, I was particularly nervous, secretly crying, not daring to cry in front of her. Now I'm fine. When symptoms appear, I look up on Douyin how to handle them! Then I often tease the old lady, making her giggle—that makes it a bit better, distracts her attention."

P7: "My husband has been with me all along, and so have the kids. He wasn't supposed to take leave for my surgery, but he did anyway. Later, when he saw I was recovering well, his father told him to go back. We face everything together as a family".

C12: "I just keep accompanying her, mostly taking leave from work. My mother is quite obedient; she basically listens to what I say. She laughs when I laugh. We face everything together as a family."

2. Conflict and Compromise in Coping Strategies

Due to differences in role division and individual needs, patients and caregivers often experience conflicts in specific coping strategies—patients tend toward "rest and avoidance," while caregivers tend toward "active intervention." Conflicts frequently center around dietary control, activity mobilization, and healthcare decisions, often ending in passive compromise. However, post-compromise implementation outcomes are suboptimal, with significantly increased risk of repeated hospitalizations.

P12: "I have severe constipation now and can't sleep, but I don't want to do anything—I just want to lie down at home. My daughter keeps nagging me every day to do this and that—it's really annoying."

C11: "After coming home, he had diarrhea. I told him to eat less oil, and he argued with me. Later, when he got constipated, I told him to drink more water and eat more vegetables, and he got angry. Within less than a month after discharge, he'd been back and forth to the hospital three times. Soon he'd drive me crazy—how can anyone have time for this, day after day!"

P5: "I didn't want treatment, but the kids insisted I come to the hospital. I just want to take a knife and kill myself. I keep blaming the kids—why won't they let me die? I'm suffering so much! But there's no choice now; we've already come this far."

Binary Imbalance and Complementarity of Support Needs

1. Emotional Support Imbalance

Both patients and caregivers face high-intensity emotional support needs, but due to differences in role functions and uneven distribution of family resources, the support acquisition and provision between both parties are often in a state of imbalance. Caregivers typically bear the main emotional regulation tasks yet lack external channels for emotional relief, while patients choose silence due to "not wanting to burden family," further exacerbating the fracture of the support system.

C2: "My younger brother is like a child; he doesn't understand anything, and he doesn't care either. I already told them Mom just had surgery, don't come back if you have a cold—but they still came back and got Mom infected with a cold."

C9: "How can I cope? You try it—he goes to the toilet more than 20 times a day. I have high blood pressure myself, alone here taking care of him all night long. The nurses and doctors only come for rounds to check—no one cares about us. They just tell us to wait in the ward. The attending surgeon only cares about the operation; we can't see him at other times. You coming to chat with me really makes me feel much more at ease."

P1: "The kids have their own families and their own children to take care of."

2. Complementarity and Limitations of External Support

External support (including medical professional guidance, community resources, information support, etc.) plays an irreplaceable complementary role in meeting the needs of patients and caregivers. However, its provision is delayed in timing and fragmented in content, significantly limiting its effectiveness, directly resulting in patients being repeatedly hospitalized for preventable reasons (such as improper stoma care, inappropriate diet, medication confusion).

C5: "It's so hard at home—we don't know how to change the pads, and we always get it on the bed. At the hospital, the nurses did it all—it seemed so simple. If only you had taught me before discharge."

C1: "There are chemotherapy drugs and other medications—so many. How do we take them? Is there a sequence? We're old and can't remember. It would have been great if you had written it down for me at discharge. Also, what can we eat at home, and what can't we eat? How much oil should we use in cooking? Last time, the diarrhea was because of too much oil. The doctors in our hometown aren't good—if something goes wrong, we have to come to your hospital. We absolutely can't let things get worse at home."

P6: "We can't manage at home. We've been back and forth to the hospital three times already—first admission for surgery, second time for diarrhea, third time for constipation."

Quantitative Study Results: Demographic and Disease-Related Data of Patients After Sphincter-Preserving Surgery for Rectal Cancer (**Table 4**).

Table 4 Demographic data of research participants (N=168)

Variable	Category	Frequency (N)	Percentage [%]
Gender	female	106	63.10%
	Male	62	36.90%
Age	45-60	47	27.98%
	>60	121	72.02%
Education level	Primary school or below	117	69.60%
	Junior high/technical secondary	41	24.40%
	Senior high/junior college	10	6.00%
Residence	Urban	54	32.10%
	Rural	114	67.90%
Employment status	Employed	11	6.50%
	Not employed	157	93.50%
Family monthly income per capita	<3000	40	23.80%
	3000-5000	108	64.30%
	>5000	20	11.90%
Number of caregivers	1	56	33.33%
	2 or more	112	66.70%
BMI	<18.5	6	3.60%
	18.5-23.9	47	27.98%
	24-27.9	103	61.31%
	≥28	12	7.14%
Surgical approach	Open	2	1.20%
	Laparoscopic	166	98.80%
Tumor T stage	T1	16	9.50%
	T2	40	23.80%
	T3	101	60.12%
	T4	11	6.50%
Tumor N stage	N0	74	44.00%
	N1	56	33.33%
	N2	38	22.62%
Tumor distance from anal verge	<5cm	30	17.90%
	5-10cm	102	60.70%
	>10cm	36	21.40%
Preoperative neoadjuvant therapy	Yes	30	17.86%
	no	138	82.14%
Postoperative chemotherapy	yes	136	80.95%
	no	32	19.05%
Chronic disease history	yes	90	53.60%
	no	78	46.40%
Postoperative anastomotic leakage	yes	5	2.98%
	no	163	97.02%

Longitudinal Distribution of LARS Symptoms at T0–T4 Time Points in Patients After Sphincter-Preserving Surgery for Rectal Cancer (**Figure 1**)

- (1) T0 (discharge): 54 cases (32.14%) in the asymptomatic group, 114 cases in the symptomatic group, including 79 cases (47.02%) with mild symptoms and 35 cases (20.83%) with severe symptoms.
- (2) T1 (2 weeks post-surgery): 38 cases (22.62%) in the asymptomatic group, 130 cases in the symptomatic group, including 80 cases (47.62%) with mild symptoms and 50 cases (29.76%) with severe symptoms—the highest proportion of severe symptoms across all time points.
- (3) T2 (1 month post-surgery): 48 cases (28.57%) in the asymptomatic group, 120 cases in the symptomatic group, including 90 cases (53.57%) with mild symptoms and 30 cases (17.86%) with severe symptoms.
- (4) T3 (3 months post-surgery): 121 cases (72.02%) in the asymptomatic group, 47 cases in the symptomatic group, including 38 cases (22.62%) with mild symptoms and 9 cases (5.36%) with severe symptoms.
- (5) T4 (6 months post-surgery): 155 cases (92.26%) in the asymptomatic group, 13 cases in the symptomatic group, including 11 cases (6.55%) with mild symptoms and 2 cases (1.19%) with severe symptoms.

Trends in LARS Symptom Scores Over Time in Patients After Sphincter-Preserving Surgery for Rectal Cancer (**Figure 2**). Longitudinal tracking of 168 patients with rectal cancer post-surgery revealed changes in LARS symptom scores at five time nodes: T0 (21.958±8.946), T1 (24.470±9.656), T2 (21.702±7.716), T3 (11.720±9.664), and T4 (8.036±5.806). Repeated measures ANOVA showed that LARS symptom scores changed significantly over time ($p < 0.01$), with scores at T1 reaching their peak, significantly higher than at all other time points ($p < 0.01$), indicating that 2 weeks post-surgery (T1) is the time node when LARS symptoms are most severe (**Table 5**).

Table 5 Comparison of LARS symptom scores at T0–T4 stages

Time node	N	LARS score	Statistical value	P value	Comparison with peak group
T0		21.958±8.946			<0.01
T1 (peak)		24.470±9.656			-
T2	168	21.702±7.716	F=855.595	<0.01	<0.01
T3		11.720±9.664			<0.01
T4		8.036±5.806			<0.01

Descriptive statistical results for LARS symptoms, social support dimensions, and self-management scores at T0–T4 time points showed: social support total scores were T0 (31.077±6.374), T1 (29.768±5.727), T2 (28.321±5.012), T3 (27.643±4.012), T4 (27.714±3.976). Support utilization scores were T0 (3.833±2.891), T1 (4.107±2.805), T2 (4.310±2.599), T3 (5.286±2.224), T4 (5.357±2.159). Self-management scores were T0 (24.839±9.304), T1 (25.655±8.917), T2 (26.786±9.173), T3 (43.530±12.070), T4 (46.345±9.840). See **Table 6** for details.

Table 6 LARS scores, social support total scores, and self-management scores at T0–T4

	T0	T1	T2	T3	T4
LARS score	21.958±8.946	24.470±9.656	21.702±7.716	11.720±9.664	8.036±5.806
Social support total	31.077±6.374	29.768±5.727	28.321±5.012	27.643±4.012	27.714±3.976
Support utilization	3.833±2.891	4.107±2.805	4.310±2.599	5.286±2.224	5.357±2.159
Self-management	24.839±9.304	25.655±8.917	26.786±9.173	43.530±12.070	46.345±9.840

Discussion

High LARS prevalence and dynamic trajectory

The overall LARS incidence was 77.38%, with severe LARS at 29.76%, reflecting a high burden. Age is a key risk factor: 72.02% of patients were > 60 years, in whom pelvic floor muscle atrophy, reduced nerve repair capacity, and lower anal resting pressure impair postoperative sphincter control, further worsened by comorbidities[12]. Treatment factors also contribute: 80.95% received postoperative chemotherapy, whose neurotoxicity and mucosal injury exacerbate alternating diarrhea/constipation[13]. Dietary habits (high oil/salt) and alcohol intake in this predominantly rural, mountainous sample further compromise intestinal compensation. High-frequency defecation induces "toilet dependence" and social withdrawal, which, through the brain-gut axis, creates a "symptom-anxiety-worsening" vicious cycle[14].

Longitudinal tracking revealed a clear "rise-peak-decline-stabilization" pattern: T1 (2 weeks) was the peak, followed by a decline at T2 and stabilization at T3–T4. While the trend partially aligns with some foreign cohorts, the peak timing differs—others report peaks at 3–6 months[15]. This discrepancy may stem from later first follow-up, cultural differences in symptom reporting, and the predominance of laparoscopic surgery (98.8%) in our cohort, which reduces trauma, advances inflammatory resolution, and accelerates bowel function reconstruction[6]. These findings confirm a directional, stage-specific trajectory—from acute decompensation to functional compensation —providing direct evidence for stage-based nursing.

Postoperative week 2 is the symptom peak and "golden window"

At T1, the LARS score (24.470 ± 9.656) was significantly higher than at all other time points ($p < 0.01$), with 29.76% having severe LARS. This peak arises from multiple overlapping mechanisms: (1) persistent postoperative inflammation and edema[16]; (2) unstable gut flora from reduced intake; (3) the neorectum's lack of storage/compliance capacity[17]; and (4) disrupted pelvic nerve reflex arcs[18]. Treatment factors—opioid-induced dysmotility and antibiotic-related flora shifts—also contribute. Psychosocially, T1 coincides with the hospital-to-home transition, when self-management is lowest (25.655 ± 8.917) and support utilization is minimal (4.107 ± 2.805). Anxiety, via the brain-gut axis, further worsens symptoms. Qualitative data confirmed that severe LARS at T1 reduces quality of life, limits social function, and may cause readmission, interrupting rehabilitation and deepening psychological trauma. Conversely, effective management before T1 can promote a benign trajectory. Thus, week 2 is not only the symptom peak but also the critical "golden window" for intervention.

Cognitive unification and empathy reconstruction as the starting point

Patients and caregivers showed significant cognitive divergence in symptom perception and attribution, leading to empathy gaps and communication breakdown. Patients' private, distressing somatic symptoms (incontinence, pain) foster anxiety, shame, and concealment[19], while caregivers, observing only overt behaviors, misinterpret patients' withdrawal as non-adherence. Over time, this creates bidirectional misunderstanding and emotional strain. Moreover, patients' negative emotions and caregivers' stress form a mutually reinforcing loop, consistent with dyadic stress models[20]. Therefore, intervention should begin with cognitive unification and empathy reconstruction. We recommend dyadic health education using visual tools to illustrate LARS mechanisms and evolution, situational simulation to promote mutual understanding, and emotion cards for daily emotional expression. This should be initiated before discharge (T0) to equip both parties before the peak arrives.

Goal-oriented conflict resolution to enhance binary collaboration

Dyadic coping showed both positive collaboration and negative conflict. While mutual support is beneficial, conflicts arise from differing roles and needs, especially under the influence of filial piety and reciprocal care norms[21]. Patients prioritize symptom relief and avoid burdening family, sometimes opting for "minor treatment"; caregivers prioritize survival, bearing heavy care loads with insufficient knowledge, leading to exhaustion. Conflicts peak during early symptom escalation—when patient burden and caregiver uncertainty are highest[22]. Over time, compromise occurs. We recommend a shared decision-making team (physicians, nurses, nutritionists, patients, caregivers) using frameworks like the Ottawa Decision Support Framework to align expectations, reduce decisional conflict, and improve coping[23]. Early psychological involvement—emotional self-disclosure, perspective-taking, and reflective listening—can strengthen dyadic synergy[24].

Family relationship adjustment and three-level support network

Support needs in the dyad are both imbalanced and complementary, consistent with "support asymmetry" theory[25]. Patients' stigma-driven concealment and caregivers' "hidden anger" under "selfless dedication" expectations mask real emotional needs, straining family relationships[26]. Hospital and community services often target individuals rather than dyads, lacking integrated support. The discharge transition (T0–T1) is when support gaps are most evident, as caregivers explicitly voiced needs for practical guidance. Interventions should address both: multimedia psychoeducation, daily "success sharing" to foster gratitude and affirmation, and enhancing patient self-care while optimizing caregiver time[27]. A digitalized hospital-community-family three-level network can provide family-centered, empowered support, alleviating work-care conflicts and achieving dyadic balance and complementarity[28].

Integrated framework: symptom trajectory as longitude, intervention timing as latitude

Synthesizing trajectory mapping, peak identification, and dyadic interaction analysis, we propose a staged intervention framework: (1) Symptom escalation phase (pre-discharge to week 2): early warning, assessment, caregiver training, and self-management education before the peak. (2) Peak plateau phase (week 2): proactive follow-up and intensive support synchronized with symptom severity. (3) Decline phase (month 1 onward): consolidation and maintenance of bowel function and self-management. Binary interventions—cognitive unification, empathy reconstruction, conflict resolution, and support integration—are embedded within this temporal framework, forming a "time-content" dual-dimensional practice plan that provides systematic evidence-based guidance.

Conclusion

LARS after sphincter-preserving surgery for rectal cancer follows a dynamic trajectory: peaking at 2 weeks post-surgery, then gradually declining and stabilizing by 3–6 months. Week 2 is both the most vulnerable decompensation period and a critical turning point for rehabilitation. Clinical intervention should be shifted forward to discharge (T0), completing preparatory work before symptoms peak. A family-centered dyadic support model—integrating cognitive unification, empathy reconstruction, and staged symptom management—is essential. Only by precisely aligning intervention timing with symptom rhythm can symptom exacerbation be blocked and rehabilitation outcomes be optimized.

Declarations

Clinical trial number: not applicable

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Author contributions Mei Cao: Conceptualization, Methodology, Formal analysis and investigation, Writing - original draft preparation; Hui Yang: Methodology, Formal analysis and investigation; Ping Zhu: Formal analysis and investigation; Changcui Liang: Formal analysis and investigation; Xiangdong Hu : Formal analysis and investigation; Qiushi Yin: Conceptualization, Methodology; Wenping Wei Writing review and editing, Yafei Feng Supervision.

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Data availability The datasets generated and analyzed during the current study are not publicly available due to patient privacy concerns but are available from the corresponding author on reasonable request, subject to approval from the Lu'an People's Hospital ethics committee.

Declarations Ethics approval The experimental protocol was approved by the Ethics Committee of Lu'an People's Hospital (No.2024LL023), according to the World Medical Association Declaration of Helsinki.

Consent to participate All patients are informed and agree to be reported in the present study.

Permission to reproduce material from other sources Not applicable.

Competing interests The authors declare no competing interests.

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Figures

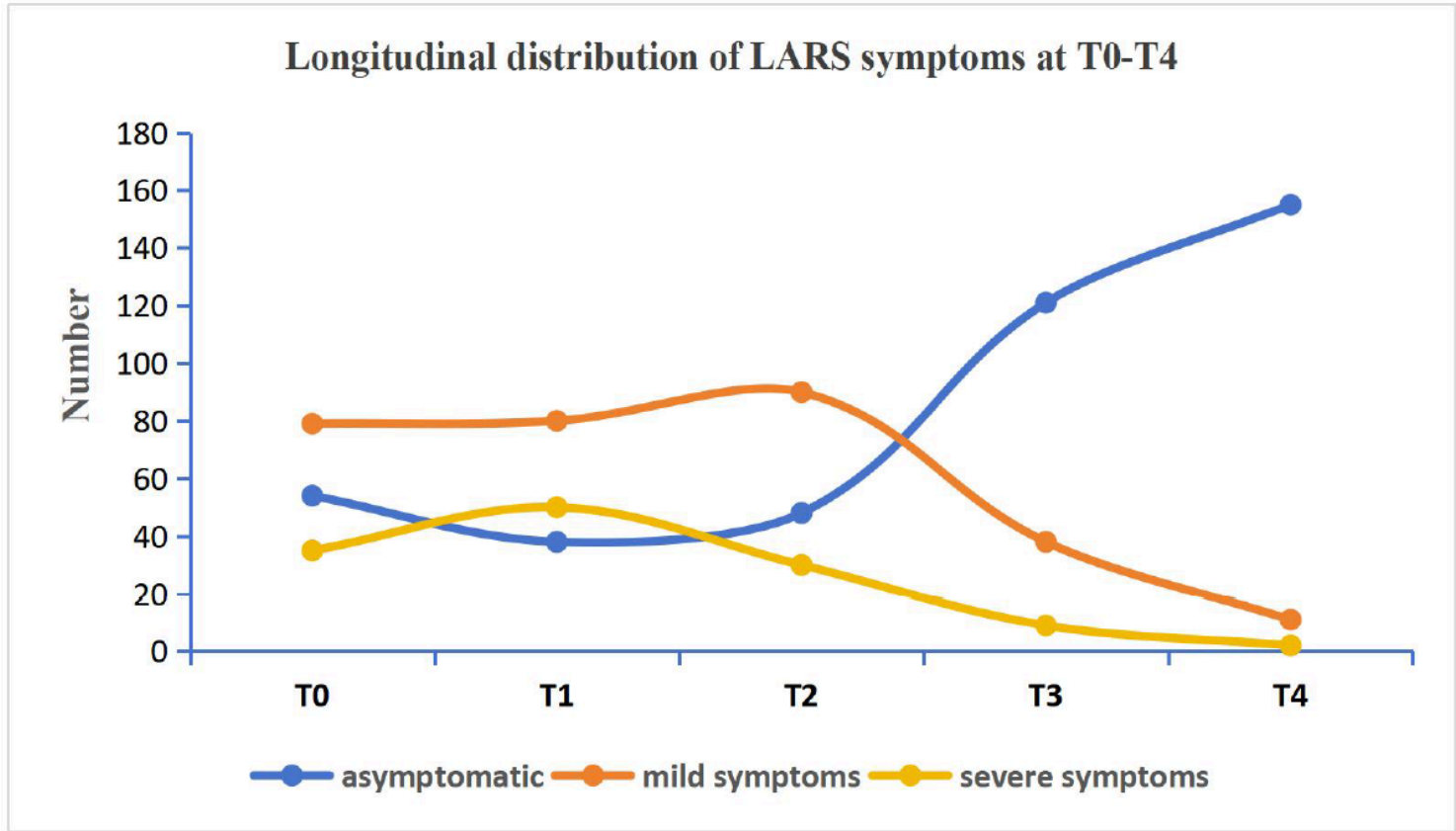


Figure 1
Longitudinal distribution of LARS symptoms at T0-T4

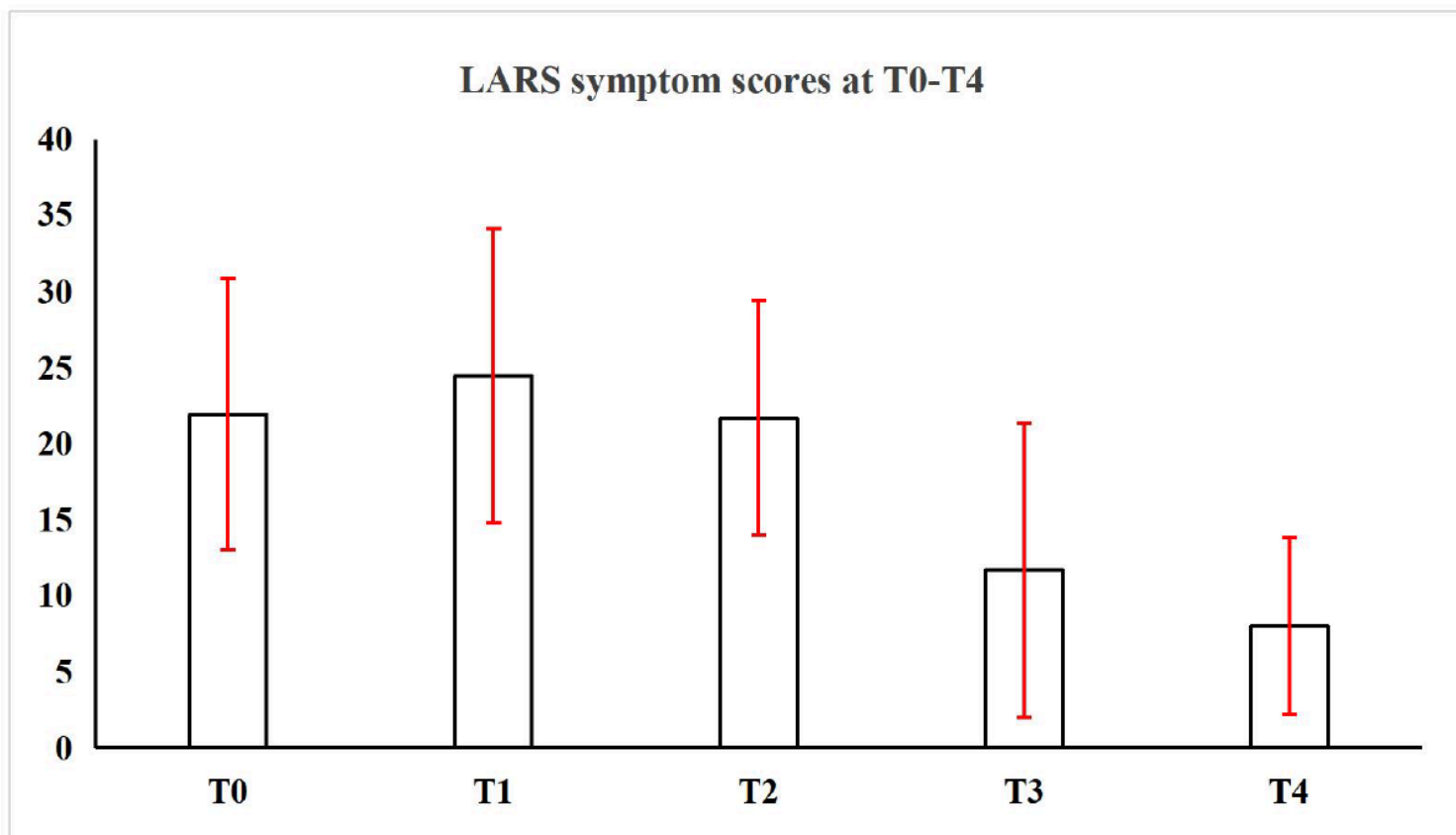


Figure 2

LARS symptom scores at T0-T4