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Observational Study

Bowel preparation experiences and needs before follow-up colonoscopy in older adult postoperative colorectal cancer patients: A qualitative study

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Abstract

BACKGROUND

The bowel preparation process prior to colonoscopy determines the quality of the bowel preparation, which in turn affects the quality of the colonoscopy. Colonoscopy is an essential procedure for postoperative follow-up monitoring of colorectal cancer (CRC) patients. Previous studies have shown that advanced age and a history of colorectal resection are both risk factors for inadequate bowel preparation. However, little attention has been paid to the bowel preparation experiences and needs of predominantly older adult postoperative CRC patients.

AIM

To explore the experiences and needs of older adult postoperative CRC patients during bowel preparation for follow-up colonoscopy.

METHODS

Fifteen older adult postoperative CRC patients who underwent follow-up colonoscopy at a tertiary hospital in Shanghai were selected using purposive

sampling from August 2023 to November 2023. The phenomenological method in qualitative research was employed to construct an interview outline and conduct semi-structured interviews with the patients. Colaizzi's seven-step analysis was utilized to organize, code, categorize, summarize, and verify the interview data.

RESULTS

The results of this study were summarized into four themes and eight sub-themes: (1) Inadequate knowledge about bowel preparation; (2) Decreased physiological comfort during bowel preparation (gastrointestinal discomfort and sleep deprivation caused by bowel cleansing agents, and hunger caused by dietary restrictions; (3) Psychological changes during different stages of bowel preparation (pre-preparation: Fear and resistance due to previous experiences; during preparation: Irritation and helplessness caused by taking bowel cleansing agents, and post-preparation: Anxiety and worry while waiting for the colonoscopy); and (4) Needs related to bowel preparation (detailed instructions from healthcare professionals; more ideal bowel cleansing agents; and shortened waiting times for colonoscopy).

CONCLUSION

Older adult postoperative CRC patients' knowledge of bowel preparation is not adequate, and they may encounter numerous difficulties and challenges during the process. Healthcare professionals should place great emphasis on providing instruction for their bowel preparation.

Key Words: Older people; Colorectal cancer; Colonoscopy; Bowel preparation; Health promotion; Nursing; Qualitative research

Core Tip: Patient experiences during bowel preparation significantly influence compliance and the quality of colonoscopies. Older adult postoperative colorectal cancer patients are particularly prone to poor bowel preparation quality. This study, using a phenomenological methodology with semi-structured interviews, explored the bowel preparation experiences and needs of these patients. Unexpectedly, it revealed that despite prior experience, their knowledge of bowel preparation was still inadequate. They faced substantial physical and psychological challenges, with specific needs identified during the process. This research can inform customized bowel preparation plans for this high-risk group and suggests future studies on the impact of psychological factors on bowel preparation quality.

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INTRODUCTION

According to global cancer statistics, colorectal cancer (CRC) ranks third in incidence and second in mortality rates among all malignant tumors[1]. Although there is a trend towards a younger onset of CRC, it is primarily diagnosed in older adults: 90% of CRC cases occurs in individuals over 50 years old, and 31% occurs in those over 75 years old[2]. Colonoscopy is essential for the regular follow-up of postoperative CRC patients, as it plays a critical role in reducing cancer recurrence rates[3]. The success rate of bowel preparation is a core indicator of quality control in colonoscopy[4]. Inadequate bowel preparation not only increases the rate of missed bowel polyps and adenomas[5], but also prolongs the procedure time, reduces the cecal intubation rate, shortens the interval to the next colonoscopy, and increases the total cost of colonoscopy by 12%-22%[6-8]. Numerous studies have demonstrated that advanced age and a history of colorectal surgery are independent risk factors for inadequate bowel preparation. A study by Pontone *et al*[9] showed that bowel preparation failures in predominantly older adult patients undergoing colonoscopy after colorectal resection were as high as 44%, well above the Society of Endoscopy's expert requirement that failures should be ≤ 15%-10%[10]. Bowel preparation is often considered the most unpleasant part of the colonoscopy process, so many patients may find it challenging to complete it in a standardized manner, potentially leading to lower quality bowel preparation[11,12]. A comprehensive understanding of the bowel preparation experiences and needs can help develop scientific and effective bowel preparation strategies, which are of great significance in improving both the experience and quality of bowel preparation. However, patients with a history of colorectal surgery are currently often excluded from quantitative studies on bowel preparation strategies[13], and there is a lack of qualitative research addressing their experiences and needs related to bowel preparation. This study conducted qualitative research to explore the bowel preparation experiences and needs of older adult postoperative CRC patients. By understanding their perspectives, the research aims to inform healthcare professionals and guide the development of targeted intervention strategies. These insights are expected to

enhance the quality of bowel preparation, leading to improved colonoscopy outcomes and ultimately boosting the effectiveness of postoperative surveillance for CRC.

MATERIALS AND METHODS

Study participants

The purposive sampling method was used to select older adult patients who underwent follow-up colonoscopy after CRC surgery at a tertiary hospital in Shanghai, China, from August 2023 to November 2023. The study subjects were chosen according to the principle of maximum differentiation based on the patients' gender, age, literacy level, and the number of previous bowel preparations. Inclusion criteria: (1) Age ≥ 60 years old (World Health Organization definition for older adults in developing countries); and (2) With a history of CRC surgery coming for follow-up colonoscopy. Exclusion criteria: (1) Cleansing the colorectal by artificial enema; (2) Verbal communication disorder. This includes aphasia, severe dysarthria, or other conditions affecting language comprehension and expression. The Western Aphasia Battery-Revised evaluates speech, comprehension, repetition, naming, reading, and writing. Patients with an aphasia quotient below 85 or scores below 7 in any subtest are excluded. Participants with severe dysarthria and related conditions are assessed through direct interaction by researchers. Those unable to communicate effectively are excluded; (3) Cognitive impairment, which includes dementia or significant mild cognitive impairment. The Mini-Mental State Examination is used to evaluate cognitive function, focusing on orientation, memory, attention, calculation, language, and visuospatial skills. Scores below 24 result in exclusion; and (4) Refusal of audio-recorded interview. The sample size was based on the criterion of data saturation, meaning that repeated analysis of the interview data revealed no new themes.

Development of the interview outline

The research team initially developed the interview outline based on the study's objectives and after reviewing literature related to bowel preparation experiences. The outline was further refined following discussions with veteran endoscopists and a nursing expert specializing in endoscopy. Additionally, after conducting preliminary interviews with two patients, adjustments and refinements were made to the structure of the outline, finalizing the interview outline. The final interview outline encompassed the following topics: How did you get information about bowel preparation? How did you proceed with the bowel preparation? What difficulties or challenges did you encounter during the process? How did you cope with them? Please share your feelings during the bowel preparation process before colonoscopy. What would you like the healthcare professionals to do to improve your bowel preparation experience?

Data collection and quality control

The interviews were conducted either 1 hour before or 50 minutes after the participants' colonoscopy, based on their preference. Most older adults received anesthesia during their colonoscopy and typically awoke about 10 minutes after it was stopped. After a 30-minute observation period without any unusual discomfort, they were allowed to leave the endoscopy center. Therefore, starting the interviews 50 minutes post-procedure ensured that the participants' responses were minimally influenced by the anesthetic agents. The interviews took place in a quiet and private meeting room within the endoscopy center. Before starting, the purpose, significance, and methods of the study were explained to the participants. Privacy was safeguarded by using a numerical identifier instead of patient names, and their consent was obtained before beginning and recording the interviews. Semi-structured interviews were conducted, where the interviewer asked questions based on an outline, adjusted the questioning style and order as needed without giving hints, and employed techniques such as retrospection, rhetorical questioning, restatement, and responsive listening. The expressions, emotions, and gestures of the participants were meticulously noted. Each interview lasted between 40 minutes to 50 minutes. Additionally, after refining themes from the interview data, follow-up phone calls were made to the participants. During these calls, the interviewers recapped the participants' statements and the derived themes back to them to ensure the participants' agreement with and recognition of these themes.

Statistical analysis

Audio recordings were transcribed verbatim into textual documents on the day of the interviews, and these transcripts were subsequently reviewed for accuracy by two researchers. Non-verbal information, such as expressions, emotions, and gestures, captured during the interviews was systematically annotated in the corresponding sections of the participants' textual documents. The data were analyzed using Colaizzi's seven-step method[14] for thematic extraction and summarization, which includes: (1) Repeatedly listening to and reading all interview records; (2) Analyzing the data sentence by sentence to identify significant statements; (3) Coding recurrent and meaningful statements; (4) Aggregating the coded statements to form preliminary themes; (5) Writing detailed, exhaustive descriptions; (6) Summarizing similar viewpoints to refine thematic concepts; and (7) Returning the analysis results to the participants for validation and confirmation.

Bowel preparation instructions

At their colonoscopy scheduling appointment, participants received face-to-face dietary and medication instructions. They were advised to follow a low-residue, low-fiber diet including noodles, white rice porridge, boiled eggs, steamed buns, and water, and to finish dinner by 18:00 the day before the procedure, avoiding food afterward, with no drinking four hours before the colonoscopy. Guidance was provided on the timing and method of consuming a 3 L dose of

polyethylene glycol electrolyte solution (IV)[4], with 750 mL to be taken after dinner and before 20:00, and the remaining three 750 mL doses 5-6 hours before the procedure, each within 30 minutes. Simultaneously, they received a colored informational leaflet outlining further dietary guidelines, prohibited foods, methods for taking bowel cleansing agents, standards for bowel cleanliness, and precautions for taking chronic disease medications before the colonoscopy. Instructions, provided at the time of colonoscopy appointment scheduling, were on average given about five days before the procedure, with the timing ranging from as short as two days to over twenty days.

Ethical considerations

Participants were informed about the study's purpose, significance, and methods. Confidentiality was ensured by using coded identifiers, and informed consent was obtained prior to conducting and recording the interviews. This study was approved by the Ethics Committee of the hospital.

RESULTS

Fifteen participants were included in this study, and their names were replaced with the identifiers P1-P15. Only two out of fifteen participants were interviewed 50 minutes post-colonoscopy. The sample consisted of seven male and eight female participants, with ages ranging from 62 years to 81 years. Nine participants had an education level of middle school or lower, while six had a high school education or higher. The marital status of the participants included seven married with a living partner, six widowed, one divorced, and one unmarried. Eleven participants were from the outpatient clinic, and the four who were hospitalized were admitted solely for the convenience of undergoing colonoscopy, not due to any symptomatic reasons. The colorectal resection sites of the participants included the ascending colon in four, transverse colon in two, and the descending colon, sigmoid colon, and/or rectum in nine, with two participants having enterostomies. The average number of colonoscopies previously undergone by these 15 respondents was 3.2. Relevant information about the participants is shown in Table 1. The interview data were extracted and thematically summarized according to Colaizzi's seven-step analysis, resulting in four final themes and eight sub-themes that reveal the bowel preparation experiences and needs of older adult postoperative CRC patients The themes and sub-themes are presented in Table 2.

Theme 1: Inadequate knowledge about bowel preparation

Interviews revealed that although older adult postoperative CRC patients had previous experience with bowel preparation, many still lacked standardized knowledge of the procedure. Some participants interpreted the low-residue, low-fiber diet required for bowel preparation simply as a light diet, or were unclear about which specific foods were considered low-residue and low-fiber. P4: "Just eat light before the colonoscopy because I've done it a few times now and know the procedure". P12: "Yesterday, I didn't eat any coarse fiber foods with crumbs. For all three meals, I ate noodles with some tomatoes and leafy greens". In addition, several participants mistakenly believed that an occasional clear discharge indicated that they could stop taking the bowel cleansing agents. P2: "I saw that what I passed was pale yellow water, just like urine, so I didn't drink the rest". P3: "I looked in the toilet, and what came out seemed fine, no solids left. The cleanliness seemed okay, so I stopped drinking it". Some participants attributed their inadequate knowledge of bowel preparation to insufficient education provided by nurses. P1: "The nurse used to be very busy at the appointment desk, so he taught very quickly, which is why I didn't prepare very cleanly". P5: "The ward nurse just told me how to take the laxatives but didn't explain how to manage my diet". Several participants attributed their inadequate bowel preparation to their own difficulties in comprehension and memorization. P7: "Last night, I didn't understand clearly. She taught me to consume a bottle of laxative over two hours, but I consumed all 1500 mL in 10 minutes. I then realized it was the wrong way to take it". P11: "She (the teaching nurse) did tell me what to do, but my memory isn't good at my age. I only remember for a short while; my brain doesn't work well in old age".

Theme 2: Decreased physiological comfort during bowel preparation

Sub-theme 1: Gastrointestinal discomfort and sleep deprivation caused by bowel cleansing agents: The special flavor of compounded polyethylene glycol electrolyte solution (IV) and the requirement for large intake caused participants to experience gastrointestinal reactions such as oral discomfort, nausea, vomiting, abdominal distension, and anal discomfort during the administration of the drug. P2: "Drinking the laxative felt fine at first, but after a while, my stomach started to feel uncomfortable. There was so much water inside that it made me feel like I wanted to vomit". P13: "It's the smell that makes me want to vomit, it's a bit nauseating. Drinking it makes my mouth feel uncomfortable, and I get a kind of acidic numbness in my teeth". P15: "Taking the laxative just makes me feel a bit uncomfortable here (hand over abdomen). And going to the toilet so many times makes my anus hurt after a while". In addition to the digestive discomfort caused by oral purgatives, some participants reported that the necessary steps to take their nighttime medication and the excretory reactions interfered with their normal sleep. P3: "I started drinking the laxative at 8 pm last night and didn't finish until 10 pm. I was still going to the toilet for the next two hours and didn't finish until midnight. At 3 am, I had to get up again to drink more and go to the toilet. It really affected my sleep". P5: "The amount of this laxative is too much. I have to take it again after a while, and then I have to go to the toilet many times. Running back and forth, how can I sleep well at night? I didn't sleep well all night".

Sub-theme 2: Hunger caused by dietary restriction: Bowel preparation generally requires patients to follow a low-residue, low-fiber diet the day before the colonoscopy and to fast after dinner. Participants reported experiencing

Table 1 Socio-demographic and clinical characteristics of participants

Participant ID	Gender	Age (years)	Education level	Marital status	Patient category	Surgical resection Site	Previous colonoscopy/bowel preparation (times)
P1	Male	65	Junior college	Married	Outpatient	Sigmoid colon	4
P2	Female	65	Elementary	Divorced	Outpatient	Ascending colon	3
P3	Female	77	Elementary	Widowed	Outpatient	Partial rectum	2
P4	Male	66	Middle school	Single	Outpatient	Rectum (stoma)	2
P5	Male	76	Middle school	Married	Inpatient	Partial descending colon	4
P6	Female	62	Middle school	Married	Inpatient	Rectosigmoid (stoma)	5
P7	Female	81	Illiterate	Widowed	Inpatient	Transverse colon	3
P8	Female	74	Technical school	Widowed	Outpatient	Ascending colon	2
P9	Male	66	Junior college	Married	Inpatient	Partial rectum	3
P10	Male	67	High school	Married	Outpatient	Sigmoid colon	2
P11	Female	74	Elementary	Widowed	Outpatient	Ascending colon	5
P12	Male	70	Illiterate	Widowed	Outpatient	Transverse colon	7
P13	Female	64	High school	Married	Outpatient	Partial descending colon	1
P14	Male	70	Middle school	Married	Outpatient	Partial rectum	1
P15	Female	77	Junior college	Widowed	Outpatient	Ascending colon	4

Table 2 Themes and sub-themes of the study

Theme	Sub-theme
Inadequate knowledge about bowel preparation	
Decreased physiological comfort during bowel preparation	Gastrointestinal discomfort and sleep deprivation caused by bowel cleansing agents
	Hunger caused by dietary restrictions
Psychological changes curing different stages of bowel preparation	Pre-preparation: Fear and resistance due to previous experiences
	During preparation: Irritability and helplessness caused by taking bowel cleansing agents
	Post-preparation: Anxiety and worry while waiting for the colonoscopy
Needs related to bowel preparation	Detailed instructions from healthcare professionals
	More ideal bowel cleansing agents
	Shortened waiting times for colonoscopy

significant hunger after fasting, especially those scheduled for an afternoon colonoscopy. This poses a dangerous situation for patients with poorer health conditions, as well as those with diabetes. P7: "Yesterday, I only had a boiled egg and a bit of rice. I threw up the food after drinking the laxative. I am really hungry, and I am diabetic". P8: "I haven't eaten anything since last night. I'm so hungry, but I don't dare to eat anything, so I can only drink water. I have no strength left. I need to eat right after the colonoscopy". P14: "I couldn't eat anything since the night before. I didn't eat much the day before because I was afraid to. And my colonoscopy is in the afternoon, so I'll be hungry for even longer".

Theme 3: Psychological changes during different stages of bowel preparation

Sub-theme 1: Pre-preparation: Fear and resistance due to previous experiences: This study found that most participants experienced pronounced fear and resistance to purgatives and colonoscopy prior to dietary management and administration of purgatives. On the one hand, participants indicated that their previous bad experiences with oral purgatives made them afraid of taking purgatives. Some even intentionally delayed or resisted colonoscopy follow-up due to the

necessity of taking purgatives beforehand. P3: "The laxative is too hard to drink. I'm just afraid of drinking it, so in the past ten years after surgery, I've only had two colonoscopy follow-ups. If it weren't for my daughter insisting, I wouldn't have come this time". P11: "I was hesitant when I went to register for an appointment. The hesitation was because I was scared, scared of the bowel preparation procedure, because I have to drink a lot of that cleanser again". P13: "This isn't my first colonoscopy, but thinking about drinking the laxative still makes me a bit scared. I was supposed to have my follow-up in July, but I was afraid of drinking the solution, so I delayed it until now, in November". On the other hand, participants' fear prior to bowel preparation was also reflected in their fear of cancer recurrence. This fear became especially strong as the colonoscopy date approached. P6: "It's been a year since my surgery. Six months ago, during a colonoscopy procedure, they found a lot of polyps growing quickly. I don't know if I'm going to make it (crying). I'm terrified the cancer might be spreading (wiping tears)". P10: "Ever since I got this cancer, my wife says my temper has gotten so bad. Especially in the days leading up to the follow-up colonoscopy, I'm really afraid there will be polyps and that the cancer might come back. I'm so scared that my palms sweat".

Sub-theme 2: During preparation: Irritability and helplessness caused by taking bowel cleansing agents: Frequent oral bowel cleansers and the resulting frequent diarrhea during bowel preparation were very bothersome, and for participants with enterostomies, it was even more torturous. Participants felt irritated at this stage and experienced a sense of helplessness in having to go through this step. P4: "The stoma is inconvenient because after drinking the laxative, I need to pass gas and other stuff, which makes the stoma bag fill up quickly. I have to keep cleaning it, which is really bothersome. Sigh (frowning), there's no way around it, I just have to deal with it". P6: "When there's stool, it comes out so quickly that the stoma can't handle it. I have to run back and forth from the bed to the bathroom, it's really annoying. Sigh, this medicine is unbearable, but what can I do? I have to take it for the colonoscopy". P15: "After drinking the laxative, it's hard to control, and the stool just comes out on its own. When I feel the urge, I have to go immediately! It's really fast! (excited) I have to go right away, otherwise it's such a hassle".

Sub-theme 3: Post-preparation: Anxiety and worry while waiting for the colonoscopy: During the waiting period between taking the purgative and undergoing the colonoscopy, participants exhibited increased anxiety and worry about various aspects. While fasting and abstaining from food and drink, those with chronic medical conditions felt particularly anxious and worried about their physical condition. P4: "I didn't take my blood pressure medicine today, and after drinking the laxative, I haven't dared to eat anything. Can you check my blood pressure later? I don't know if it's just psychological, but I feel like my blood pressure is a bit high and I have a slight headache. Please check it for me". P7: "There are so many people here, and the wait is so long (takes out phone to check). Is it my turn yet? I heard someone fainted here from low blood sugar. I have diabetes too, and I'm afraid my body can't handle this". During this waiting period, some participants speculated on the results of the colonoscopy based on their previous experiences and felt concerned and anxious about the potentially high cost of treatment they might have to pay. P8: "Coming for a colonoscopy is always a bit worrying because I've had it done so many times before, and there were always polyps. The doctor removed them, but I had to be hospitalized. There will probably be polyps again this time, and it will cost a lot of money (shakes head slightly)". First-time participants undergoing a colonoscopy without anesthesia expressed worry about possible pain and discomfort. P9: "I'm a bit worried that it will hurt during the colonoscopy since I'm not using anesthesia this time. I have to get a colonoscopy every year, and I don't want to use anesthesia every time. I'm just not sure if it will be painful".

Theme 4: Needs related to bowel preparation

Sub-theme 1: Detailed instructions from healthcare professionals: Many participants wished that healthcare professionals would spend more time and effort teaching them about bowel preparation. Detailed and comprehensive professional guidance is especially necessary for older adults who live alone or have poor reading skills.P1: "Sometimes, older people who live alone have poor reading abilities or are not in a good mood, so they don't read the instructions carefully. When they are preparing for the colonoscopy, you need to explain it to them repeatedly. For example, you can remind us to soak some preserved plums. We need more specific reminders about the knowledge". P2: "The instructions didn't mention that we shouldn't eat things like kiwi. We need more guidance on this, and also on how to manage our diet and medication for diabetes". P13: "At the appointment desk, I sometimes feel like I can't absorb the information quickly enough. Even though the nurse gave us the instructions, those who can't read might not remember or understand it fully. They only get the gist, so we need more detailed explanations".

Sub-theme 2: More ideal bowel cleansing agents: The interviews expressed that almost all participants desired better bowel cleansing agents. They wanted future agents to taste better, require smaller doses, and not need to be taken at night. P3: "Is there a laxative that requires drinking less? It's really uncomfortable to drink such a large amount". P9: "Can this laxative be improved? It's too hard to drink, both because the amount is too much and the taste is strange. I can't stand it". P14: "But I think you will eventually improve the cleanser little by little, right? When you develop a better one, we can pay a bit more to get it and avoid so much discomfort".

Sub-theme 3: Shortened waiting times for colonoscopy: The long waiting time for colonoscopy causes significant psychological distress and physical pain. Most participants expressed a desire to minimize the number of days between appointments and colonoscopies, and preferred to have their colonoscopies done as early as possible in the morning. P1: "I wanted to suffer less and schedule it for the morning, because if it's in the afternoon, I'd be hungry for longer. But they said there were no morning slots available, only afternoon ones. So, I said okay, but an afternoon appointment is more bothersome". P9: "This process needs to be better organized. I've been waiting here for too long. This time, the wait feels much longer than before. I don't know when it'll be my turn, it makes me anxious". P14: "Since I decided to come for a

follow-up, I think it's best to get an appointment as soon as possible, ideally tomorrow. I don't want to wait for many days. Preferably in the morning, because I'm old and a long wait makes me too hungry to handle".

DISCUSSION

Emphasizing bowel preparation education for postoperative CRC patients and developing targeted education programs

The diagnosis of CRC and postoperative follow-up monitoring rely on colonoscopy, so older adult postoperative CRC patients often have some experience with bowel preparation. However, this study found that patients with extensive experience in bowel preparation had insufficient knowledge of the procedure, similar to other general patients[15]. On the one hand, this may be due to healthcare professionals often believing that patients with bowel preparation experience have better knowledge and compliance[16]. Additionally, the heavy patient load at the appointment center can result in a lack of attention to the education of these patients. On the other hand, the poor comprehension and memorization abilities of these patients mean they can only grasp a small portion of the bowel preparation knowledge provided, leading to irregularities in their bowel preparation. Insufficient knowledge of bowel preparation also leads to negative experiences during the process. Therefore, it is especially important to focus on educating older adults who are postoperative CRC patients about bowel preparation and to formulate a targeted educational program[4], which aligns with the actual needs of these patients.

Direct patient-care communication for bowel preparation education may be more suitable for older adult postoperative CRC patients. Conventional mass verbal instruction combined with informational leaflets is not suitable for older adults with weak comprehension and memory skills[17]. Additionally, due to lower e-health literacy in the older population [18], watching animated videos, using cell phone software, or virtual reality-type forms of education are not always suitable for them[19,20]. A study by Meng *et al*[21] found that 76.5% of non-first-time colonoscopy patients preferred to gain knowledge about bowel preparation through direct communication with healthcare professionals. Therefore, for older adult postoperative CRC patients in the outpatient setting, healthcare professionals can employ continuous communication methods for education. This includes detailed face-to-face instruction and distributing targeted information sheets[22] at the time of scheduling the colonoscopy. Additionally, combining this with follow-up education *via* phone calls at home ensures that both patients and their families fully understand the importance and procedures of bowel preparation[6]. Given that cognitive impairment is a significant consideration among older adults[23], adhering to bowel preparation protocols can be particularly challenging for these patients. Therefore, engaging family members comprehensively and utilizing their support and supervisory roles[24] are not just beneficial but crucial for enhancing the quality of bowel preparation. For older adult postoperative CRC patients in the hospital setting, healthcare professionals may consider adopting bedside direct instruction as the simplest and most effective form of education, avoiding other complex procedures[25]. This approach ensures that both patients and their caregivers fully understand and correctly follow the bowel preparation guidelines.

Detailed and personalized educational messages are crucial for effective bowel preparation education. In this study, some patients felt that the education they received was too simplistic. Routine mass counseling messages do not meet the complex and diverse needs of older adult postoperative CRC patients in bowel preparation[13]. In addition to routinely informing patients of dietary restrictions and the correct method of taking the purgative, healthcare professionals need to remind patients of foods that are prone to be ingested by mistake, emphasize the importance of extending dietary management to three days. Clear explanations should be provided on how to correctly determine colorectal cleanliness, and specific techniques should be instructed to alleviate gastrointestinal reactions due to medication. Given the poor intestinal peristalsis function in older adult postoperative CRC patients[26], healthcare professionals can, after assessing the patient's physical mobility, instruct them to perform appropriate exercises or chew gum during the administration of the purgative. This not only promotes intestinal peristalsis and improves colorectal cleansing but also mitigates gastrointestinal adverse reactions due to medication[27,28]. To ensure patient safety during bowel preparation and reduce their anxiety, healthcare professionals should carefully assess the physical condition of patients and provide correct instructions on the precautions to be taken when using other medications, such as chronic medications, during bowel preparation.

Focusing on the psychological status and providing support for older adult postoperative CRC patients during bowel preparation

This study found that the psychological state of patients at all stages of bowel preparation followed a pattern of fearful resistance, irritable helplessness, and anxious worry. Older adult postoperative CRC patients, influenced by their previous bowel preparation experiences, primarily exhibited fear of bowel cleansing agents and cancer recurrence during the pre-bowel preparation stage. This fear led to resistance to follow-up colonoscopy, a condition not observed in other types of patients[29]. According to a study by Cai *et al*[30], nearly 50% of postoperative CRC patients experience fear of cancer recurrence, and the impending follow-up colonoscopy evokes memories, thoughts, and even negative speculation about the outcome of their CRC journey[31]. This makes their fear of cancer recurrence even more pronounced at this stage. The uncomfortable experience of previous multiple doses of purgatives also created a deeper fear of purgatives, which they needed to overcome to face bowel preparation. During the bowel preparation stage, large doses of purgatives taken at night and frequent diarrhea interfered with the patients' normal routines, making it difficult for them to adapt despite several previous experiences[32]. Patients showed increased feelings of irritability and helplessness during this

process. In the late stage of bowel preparation, the primary psychological aspects were anxiety and worry. This is consistent with the study by Neilson *et al*[33], which found that patients had no other tasks to occupy their minds between the completion of bowel preparation and the colonoscopy, leading them to focus on the upcoming colonoscopy. The longer they waited for the colonoscopy, the more their feelings of anxiety and worry increased. However, it is noteworthy that current research on the factors influencing bowel preparation has largely overlooked the psychological aspects of patients. The association between patients' psychological states and the quality of bowel preparation warrants further investigation through large-scale quantitative studies.

To reduce negative psychological effects during bowel preparation, healthcare professionals should understand patients' previous bowel preparation experiences, assess their psychological status, and use humor to communicate with them[34]. They should explain the importance of a positive mindset for successful bowel preparation[35], and offer reassurance and encouragement. Instruction on medication techniques should be provided to alleviate patients' fear of bowel cleansing agents. For patients who fear cancer recurrence, healthcare professionals should listen patiently to their concerns, provide comfort, and, if necessary, offer psychological interventions such as cognitive behavioral therapy, exercise therapy, and mindfulness-based stress reduction[30]. Patients should be encouraged to express their emotions to healthcare professionals or family members, and techniques such as deep breathing and listening to music should be recommended to reduce negative emotions during bowel preparation. During the waiting period for the colonoscopy, healthcare professionals should pay extra attention to these patients, engage with them, and calm their anxiety and worry. This support will enhance their bowel preparation experience, help them complete the process more smoothly, and encourage them to actively return to the hospital for follow-up colonoscopies.

Optimizing healthcare processes and providing more humane services for frail older adult postoperative CRC patients

This study found that older adult postoperative CRC patients, were eager to have their colonoscopy completed as soon as possible, consistent with the findings of Wu and Fan[36]. These patients suffer physically from pain caused by stress and trauma and psychologically from more emotional distress than the general population[37]. Frail patients are prone to accidents during the long wait for the colonoscopy, and prolonging the time until the colonoscopy after completing bowel preparation reduces the quality of the preparation[38]. Therefore, they should receive more help and care.

Healthcare professionals should first carefully assess the physical condition of older adult postoperative CRC patients, and provide more convenient access to the clinic for frail and potentially at-risk patients. At the outpatient colonoscopy appointment, for older adult postoperative CRC patients, with poor physical conditions, medical and nursing staff should prioritize arranging the nearest colonoscopy date according to the actual flow of patients in the hospital and schedule the colonoscopy in the morning whenever possible. On the day of the colonoscopy, the Medical and Nursing staff of the Endoscopy Center should prioritize completing the follow-up colonoscopy to shorten the waiting time as much as possible. For hospitalized older adult postoperative CRC patients, especially those with an artificial anus, medical staff should prioritize arranging wards with fewer patients and beds closest to the bathroom to accommodate the needs of frequent diarrhea after taking bowel cleansing agents and to improve their medical experience and satisfaction.

Optimizing bowel cleansing agents for enhanced efficacy and patient experience

The current Chinese bowel preparation guideline[4] recommends using a 3 L dose of polyethylene glycol electrolyte dispersions as a bowel cleanser before colonoscopy in the Chinese population. This bowel cleansing agents is considered safer and more effective than other types. However, its unique flavor and large volume make it difficult for patients to accept. This study found that taking purgatives was the most challenging aspect of bowel preparation for older adult postoperative CRC patients, consistent with the findings of McLachlan *et al*[12]. The adverse experience of taking purgatives can lead to decreased compliance with bowel preparation, subsequently reducing its quality[39,40]. Patients are eager for a future purgative that is more palatable in flavor and dosage. Additionally, more efficient and applicable purgatives are crucial for older adult postoperative CRC patients. Some researchers have attempted to improve the quality of bowel preparation in postoperative colorectal resection patients by adjusting the dosage of polyethylene glycol bowel cleansing agents or combining them with magnesium sulfate solution[41,42], but no consistent findings have been reached. In the future, healthcare professionals and cleanser-related researchers should increase their efforts in exploring these aspects to develop safer, more effective, more comfortable, and more economical bowel cleansing agents to meet the needs of older adult postoperative CRC patients requiring multiple follow-up colonoscopy.

Strengths and limitations of the study

Strengths: This study is the first to specifically investigate bowel preparation in older adult postoperative CRC patients. In this qualitative study, older adult postoperative CRC patients were interviewed in a semi-structured manner using the phenomenological method, providing insights into their physical and psychological experiences, difficulties, challenges, and related needs during bowel preparation. This research enriches the study of special populations in bowel preparation. The findings suggest that healthcare professionals should place greater emphasis on bowel preparation for follow-up colonoscopy in older adult postoperative CRC patients. The stereotype that "prolonged illness turns the patient into a doctor" should be reconsidered. This study also suggests that the psychological state of patients may affect the quality of their bowel preparation, indicating that future research could investigate this hypothesis. This study can serve as a reference for developing bowel preparation programs for follow-up colonoscopy in older adult postoperative CRC patients in the future.

Limitations: There are several limitations to this study. Firstly, all patients interviewed were from the same hospital, and the sample size was only 15, which may have limited the diversity and complexity of the findings. Secondly, two interviews were conducted 50 minutes after the colonoscopy with sedation, and although participants who underwent

colonoscopy with sedation were fully awake and confirmed feeling no physical discomfort before the interviews, they may have concealed minor discomforts, like slight dizziness from sedative medications, which might have impacted the quality and comprehensiveness of their responses. Moreover, the mood of the patients, affected by either positive or negative colonoscopy results, may have influenced their ability to express themselves adequately. Thirdly, although the interviews were conducted the day after bowel preparation began, there may be recall bias due to memory loss in the older adults. Future multicenter studies are needed to ensure the comprehensiveness and diversity of the findings. Additionally, future interviews should consider standardizing the timing before the colonoscopy or categorizing patients by colonoscopy results to minimize potential biases from various factors.

CONCLUSION

This study found that older adult postoperative CRC patients, despite having bowel preparation experience, had insufficient knowledge of the process. They reported more negative physiological and psychological experiences during bowel preparation and expressed a desire for improved services in the future. Future research could explore the impact of psychological factors on bowel preparation quality from the patients' perspective. Healthcare professionals should recognize the unique characteristics of this group, emphasize their education on bowel preparation, monitor their psychological and physiological status, understand their actual needs, and provide psychological support and more personalized care. Additionally, there should be increased research and development of new bowel cleansing agents to explore more comfortable and effective options for patients.

FOOTNOTES

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