

Risk and Main Contributing Factors for Constipation in Patients with Gastrointestinal Cancer: A Multicenter Cross-Sectional Study in China

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Abstract

Background and objectives: The purpose of this study is to determine the risk of constipation and to identify the significant risk factors for constipation in patients with gastrointestinal cancer using the Chinese version of the Constipation Risk Assessment Scale (CRAS-C), as well as to explore the complementary constipation risk factors in patients with gastrointestinal cancer, to improve the specificity of the CRAS-C in this population, and finally to provide a theoretical basis for constipation prevention.

Research design and methods: A cross-sectional study involving multiple centers was conducted. A total of 190 patients with gastrointestinal cancer completed surveys that included demographic information, defecation habits, and the CRAS-C. The mean, SD, median, maximum, minimum, frequency, and percentage were used as indicators for the constipation risk and significant risk factors. The t-test and Chi-square tests were used to analyze constipation indicators in patients with gastrointestinal cancer.

Results: 190 patients were 58.92 ± 12.07 years of age. The total CRAS-C mean (*SD*) score was 13.22 (4.69). 51 patients (26.8%) scored lower than 11, who were at the low risk level of constipation. 139 patients (73.2%) scored 11 or above, who were at the high risk level of constipation. The top 10 factors were insufficient liquid intake (81.1%), failure to consume bran products daily (78.9%), insufficient fiber intake (77.9%), antiemetics (74.7%), cytotoxic chemotherapy (52.6%), colorectal/abdominal diseases (42.6%), opioid analgesics (35.3%), calcium channel blockers (16.3%), endocrine disorders (14.2%). Chi square test showed that constipating for most of the past 3 months, ascites and ECOG score were complementary constipation risk factors in gastrointestinal cancer patients.

Conclusion: The findings indicate that most gastrointestinal cancer patients were at a high risk of constipation. There are also several complementary constipation risk factors and CRAS-C can be further revised in future studies to make it more specific in gastrointestinal cancer patients. Integrating CRAS into the pathway of constipation management, carrying out constipation risk screening for hospitalized cancer patients, building systematic constipation prevention plan based on risk assessment are important to reduce the incidence of constipation in patients with gastrointestinal cancer, and improve the quality of life.

What Is Already Known About The Topic?

- The incidence of constipation in patients with gastrointestinal cancer is the highest and most serious among all cancer patients.
- The Chinese version Constipation Risk Assessment Scale (CRAS-C) demonstrated favourable content validity, predictive validity and interrater reliability in cancer patients in the previous study and could be used in the identification of cancer patients at risk of constipation. But it hasn't been used in gastrointestinal cancer patients.

What This Paper Adds

- The risk of constipation in patients with gastrointestinal cancer is generally high, which needs to be paid attention to.
- There are also several complimentary constipation risk factors and CRAS-C can be further revised in future studies to make it more specific in gastrointestinal cancer patients.

1. Introduction

In recent years, cancer incidence has been increasing year after year. According to the most recent report from China, 3,929,000 new cancer cases were diagnosed in 2015. Colorectal cancer, esophageal cancer, and other gastrointestinal cancers were the most frequently diagnosed types of cancer^[1]. Constipation is a prevalent symptom in cancer patients, with an incidence rate of approximately 32–87% in patients with advanced cancer^[2]. Specifically, constipation is more severe in gastrointestinal cancer patients, occurring at the highest rate of all cancer patients^[3, 4]. Constipation significantly impairs cancer patients' comfort and quality of life, increases psychological stress and medical costs, and may even result in complications such as fecal impaction, gastrointestinal obstruction, and gastrointestinal perforation, all of which impair the implementation of anticancer therapy^[5, 6].

Numerous risk factors influence the occurrence of constipation in cancer patients. The risk factors include general demographic variables such as gender and age, lifestyle variables such as fiber intake, water consumption, physical activity, pelvic conditions, abdominal disorders, and medication variables such as cytotoxic chemotherapy medications, antiemetics, and analgesics^[7]. Additionally, the risk factors for constipation are more complex in patients with gastrointestinal cancer. The interaction of multiple risk factors complicates the prevention and management of constipation. Constipation is more challenging to control and manage in patients with gastrointestinal cancer due to the complexity of risk factors.

It is beneficial to screen the population at high risk for constipation and identify the primary constipation risk factors for cancer patients individually using constipation risk assessment tools, to implement targeted prevention measures. However, few studies have examined the risk and primary risk factors for constipation in patients with gastrointestinal cancer. In 2006, Richmond et al. developed the Constipation Risk Assessment Scale (CRAS), a valid and reliable tool for assessing cancer patients' constipation risk^[8]. In a previous study, we translated and adapted the tool into Chinese. Although the Chinese version of the Constipation Risk Assessment Scale (CRAS-C) has demonstrated content validity, predictive validity, and inter-rater reliability in cancer patients^[9], it has not been used in gastrointestinal cancer patients.

Additionally, some other risk factors not included in the Constipation Risk Assessment Scale may influence the occurrence of constipation in patients with gastrointestinal cancer. Therefore, it is critical to investigate additional risk factors to increase the specificity of risk assessment in patients with gastrointestinal cancer.

The purpose of this study is to determine the level of constipation risk and identify the significant risk factors for constipation in patients with gastrointestinal cancer using the Chinese version of the Constipation Risk Assessment Scale (CRAS-C), as well as to investigate the complementary constipation risk factors in this population, to improve the specificity of the CRAS-C, and finally to provide a theoretical basis for constipation prevention.

2. Participants And Methods

2.1 Patient population and study design

To ensure the representativeness of the sample, a multicenter descriptive cross-sectional study was conducted in two cancer hospitals and the Department of Gastrointestinal Oncology of a general tertiary hospital in Beijing, China, between December 2019 and January 2021. The proportion of high constipation risk was the primary outcome of this study. $N = [(Z_{\alpha/2})^2 * (1-p) * p * D] / E^2$ ^[10] was the sample size estimation formula, where E, estimated as 0.1, indicates the margin of error, D, which reflects the sampling design used in the survey type of study and by default is 1, indicates the design effect, and α was 0.05. The result of our pilot study conducted in December 2019 showed that the proportion of patients with high constipation risk was 0.533. Considering a 90.0% effective response rate, the minimum sample size is 96. Eligible patients were those ≥ 18 years old, diagnosed with gastrointestinal cancer pathologically, understood Chinese, and gave written informed consent. Patients who were diagnosed with bowel obstruction based on imaging findings, who had diarrhea (loose or watery stool three or more times a day) or intestinal stoma, and who were admitted to the hospital for the operation were excluded. A convenience sample of 190 patients consented to participate, and all provided complete data.

2.2 Instruments

Gender, age, education, marital status, occupation, residence, medical payment types, income, and an Eastern Cooperative Oncology Group (ECOG) score were obtained using a self-designed demographic questionnaire. The latest diagnosis and stage, complications, comorbidities, prior surgery history, anticancer treatment, and whether or not the patients have been constipated for the majority of the last three months are all considered the disease and treatment-related information. Constipation in this study was defined as having fewer bowel movements than normal, which occurred at least three times per week; having harder stools, i.e., type 1 stools (separate hard lumps, similar to nuts) and type 2 stools (sausage-shaped but lumpy) on the Bristol Stool Form Scale^[11]; and having difficulty defecating, i.e., straining during defecation, incomplete defecation, longer time taken, and enemas/digitation/laxative use. Constipation was defined as long as the patient met one of the three criteria.

CRAS-C was used to determine the level of constipation risk and main risk factors. The primary CRAS was developed in 2006. The reliability and validity of CRAS are well-documented. We translated and adapted it into Chinese and tested its validity and reliability in previous study^[9]. The CRAS-C consists of 25 items and four subscales. The first subscale (5 items) includes gender, mobility, fiber intake, liquid

intake, and bran products consumed; the second subscale (2 items) is only filled in by inpatients or patients who require a commode/bedpan to evaluate whether they have difficulties in defecating after changing the toilet facilities; the third subscale (7 items) includes physiological and psychological factors; and the fourth subscale (11 items) includes a variety of medications increasing the risk of constipation. Each item is scored differently and separately. The total score (1–33) is the sum of all the whole items. The scale-content validity index is 0.99, and the item-content validity index is 0.80–1.00. The area under the curve of CRAS-C is 0.723 on predictive validity, and the largest Youden index is 0.372 at 11. The sensitivity and specificity are 0.887 and 0.500. A CRAS-C score of ≥ 11 indicates a high risk of constipation, while a score of < 11 indicates a low risk of constipation. The intraclass correlation coefficient (ICC) between two raters on the total CRAS-C score is 0.96.

2.3 Study Procedures

The Peking University Institutional Review Board approved the study ethically (IRB00001052-19043). By reviewing medical records, the researcher identified potentially eligible patients. The researcher then went into detail about the study's objective and the participants' rights. All participants provided informed consent. After the survey of each patient, the researchers checked whether the data was complete. There was no missing value in the data of 190 cases in this study.

2.4 Data analysis

IBM SPSS Statistics 22.0 was used to analyze the data (IBM Corp., New York, USA). The mean, SD, median, maximum, minimum, frequency, and percentage were used to describe the basic characteristics, the CRAS-C score, and significant risk factors. In addition, the t-test and Chi-square tests were used to analyze constipation indicators in patients with gastrointestinal cancer. Two-sided P values < 0.05 were considered statistically significant.

3. Results

3.1 Patients Characteristics

The average age of the patients ($n = 190$) is 58.92 ± 12.07 years old, ranging from 22 to 86. The majority of the patients were male (64.7%) and married (93.2%), and about half (54.2%) of them were retired (Table 1). Gastric cancer is the most commonly diagnosed cancer (28.4%), followed by colorectal cancer (25.8%) and esophageal cancer (17.9%). Most of the patients (79.5%) are at the IV stage of cancer, with a comorbidity rate of 72.1%. 63.7% of participants are administered antineoplastic treatment, and chemotherapy (52.6%) is the primary treatment method (Table 2).

3.2 Constipation risk of patients with gastrointestinal cancer

The total CRAS-C mean (SD) score is 13.22 (4.69) among 190 gastrointestinal cancer patients. 51 patients (26.8%) scored lower than 11, who are at the low-risk level of constipation. Among the 139

patients (73.2%) who scored 11 or above, many are at high risk of constipation.

3.3 Primary constipation risk factors of patients with gastrointestinal cancer

Among the 25 risk factors of constipation, the top 10 factors are insufficient liquid intake (81.1% of the patients with liquid intake < 2000 mL/day), failure to consume bran products daily (78.9%), inadequate fiber intake (77.9% of the patients with fruit or vegetable intake < 500g/day), antiemetics (74.7%), cytotoxic chemotherapy (49.5%), colorectal/abdominal diseases (42.6%), female (35.3%), opioid analgesics (26.8%), calcium channel blockers (16.3%), and endocrine disorders (14.2%) (Table 3).

3.4 Complementary constipation risk factors in gastrointestinal cancer patients

Two independent samples of t-tests showed no correlation between age and constipation. However, the Chi-square test showed that factors including constipating for most of the past three months, ascites, and ECOG scores are related factors to constipation (Table 4).

4. Discussion

Constipation is a significant risk factor for patients with gastrointestinal cancer and requires additional attention. The constipation risk was assessed in this study using the Chinese version of the Constipation Risk Assessment Scale. The validity and reliability of the CRAS-C have been thoroughly evaluated in our previous study, and the scale's cutoff point is 11. In 190 patients with gastrointestinal cancer, the CRAS-C score was 13.22 ± 4.69 . It was, on average, at a high risk of constipation. Among 190 patients, 51 (26.8 percent) had a score of less than 11, indicating a low-risk level of constipation, while 139 (73.2 percent) had a score of 11 or higher, indicating a high-risk level of constipation. In a previous study, the risk of constipation was high in 47.0 percent of 302 patients with multiple cancer diagnoses^[12]. On the other hand, patients with gastrointestinal cancer have a higher risk of constipation. This is consistent with studies indicating that constipation is significantly higher in patients with gastrointestinal cancer than in other cancers.

The findings indicated that diet and medication-related factors were the primary risk factors for constipation. Constipation-related risk factors are more prevalent in patients with gastrointestinal cancer, as they are affected by symptoms, examination, and treatment. To begin with, patients with gastric, esophageal, colorectal, and other gastrointestinal cancers frequently experience anorexia, nausea, early satiety, abdominal pain, and other symptoms that impair fiber and water intake. Second, 63.7 percent of patients in this study were treated with anti-tumor medication, while 52.6 percent were treated with chemotherapy. Chemotherapy can result in nausea, vomiting, and loss of appetite, among other side effects.

Additionally, because the food selection in hospitals is limited compared to that at home, fiber, water, and brain intake are reduced during hospitalization. The European Society for Medical Oncology's guidelines for managing constipation in patients with advanced cancer include recommendations for preventing constipation caused by lifestyle factors^[6]. These recommendations are also appropriate for patients who have been diagnosed with gastrointestinal cancer. Palliative care is defined as patient- and family-centered care that aims to maximize the quality of life through the prevention, reduction, and treatment of suffering. Palliative care should be available throughout an illness, beginning with diagnosis^[13]. Constipation is a common complication for gastrointestinal cancer patients and a significant cause of morbidity and distress that is frequently under-appreciated. Constipation risk assessment and prevention should therefore be performed following disease diagnosis.

Furthermore, the results indicated that the use of analgesics, antiemetics, and chemotherapy drugs increased the risk of constipation in patients with gastrointestinal cancer. Opioid-induced constipation (OIC) is common, with a rate ranging between 40% and 80%, and will not be tolerated with prolonged use^[14-16]. According to this study, 26.8% of 190 patients with gastrointestinal cancer used opioids. According to the National Comprehensive Cancer Network (NCCN) clinical practice guidelines for adult cancer pain management, laxatives should be prescribed to patients who take opioids^[17]. However, a previous study in Mainland China found that prophylactic laxatives were prescribed at a rate of only 48.5%, implying that OIC prevention is insufficient. Additionally, the prevention and treatment of OIC constipation should be standardized^[18]. Chemotherapy is one of the most comprehensive cancer treatments available. Constipation is a common side effect of vinblastine and other chemotherapy drugs^[19]. Antiemetics that block 5-HT₃ receptors are widely used to prevent and treat chemotherapy-induced nausea and vomiting, with constipation as the primary adverse effect^[20]. As a result, chemotherapy patients are more likely to experience constipation. 52.6% of patients in this study received cytotoxic chemotherapy, and 74.7% received antiemetics. As a result, it is critical to develop and implement standardized constipation prevention measures for chemotherapy patients.

Incorporating CRAS into the management pathway of patients with gastrointestinal cancer is essential. Duffy J et al. used a constipation risk assessment tool to identify patients at increased risk of constipation and implemented a constipation prevention strategy in these patients. Constipation was significantly reduced as a result of this intervention^[21]. Additionally, previous research showed that CRAS increased physician, nurse, patient, and other health team members' awareness of constipation in cancer patients. Additionally, the effort resulted in developing policy, implementation, and practice changes regarding constipation management in cancer patients at a comprehensive cancer center^[12]. In a best practice implementation project for advanced cancer patients in Mainland China, constipation risk assessment tools were identified as the primary impediment to constipation prevention^[22]. We previously translated CRAS into Chinese and confirmed the tool's reliability and validity. Thus, CRAS-C could be integrated into the constipation management pathway for patients with gastrointestinal cancer in the future. Targeted preventive measures can be administered based on the results of the constipation risk screening.

Moreover, the results indicated that constipation for the majority of the preceding three months, ascites, and an ECOG score of 1 or greater were all associated with constipation in patients with gastrointestinal cancer. Additionally, we examined the effects of commonly used medications on constipation in gastrointestinal cancer patients but found no significant results. Future research should focus on additional constipation risk factors, the development of a more specific risk assessment tool, and the implementation of constipation prevention programs based on risk assessment in gastrointestinal cancer.

This study has some limitations. First, a convenient sampling technique was used. Even if the sample size was sufficient, the sample representativeness might be poor. Second, because this is a cross-sectional study, it is difficult to grasp the dynamic trajectory of constipation risk change in patients with gastrointestinal cancer.

5. Conclusion

In summary, this study is one of the few that has examined the risk of constipation in patients with gastrointestinal cancer using the Constipation Risk Assessment Tool. The findings indicated that most patients with gastrointestinal cancer are at a high risk of constipation, which requires awareness from medical staff. There are also several additional risk factors for constipation, and future studies can refine the CRAS-C to make it more specific for patients with gastrointestinal cancer. Integrating CRAS into the constipation management pathway, conducting constipation risk screening for hospitalized cancer patients, and developing a systematic constipation prevention plan based on risk assessment is critical for lowering the incidence of constipation and improving quality of life in patients with gastrointestinal cancer.

Declarations

-Funding: This work was supported by the Peking University Cancer Hospital's Science Foundation [grant number 2021-19], and was supported by Xiaoxiao Ma.

-Conflict of interest statement: The authors declare that there is no conflict of interest with regard to this research, authorship, and/or publication of this article.

-Ethics approval: This study was approved by the Ethics Committee of Peking University Cancer Hospital.
Informed consent: The written informed consent was obtained.

-Consent to participate: Research assistants explained the study purpose, procedures, and participants' role in the study to all prospective participants before they started. Patients and family caregivers were informed that the autonomy to participate or withdraw in this study at any time was respected.

-Consent for publication: N/A

-Availability of data and material: The datasets used or analysed during the current study are available from the corresponding author on reasonable request.

-Code availability:SPSS version 20.0(IBM Corp., New York, USA), which was download from Peking University Health Science Library.

-Author contributions:

Xiaoxiao Ma: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing-original draft, Project administration, Funding acquisition.

Qian Lu: Conceptualization, Methodology, Writing-review & editing.

Yuhan Lu: Conceptualization, Methodology, Writing-review & editing, Supervision. Xin Li: Methodology, Investigation.

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Tables

Table 1. Demographic characteristics (n=190)

Variables	n (%)
Age($\bar{x}\pm S$)	58.92±12.07
Gender	
<i>Male</i>	123 (64.7)
<i>Female</i>	67 (35.3)
Education status	
<i>Primary School or less</i>	29 (15.3)
<i>Junior High School</i>	49 (25.8)
<i>Senior High School</i>	45 (23.7)
<i>Junior College</i>	35 (18.4)
<i>College or greater</i>	32 (16.8)
Marital status	
<i>Married</i>	177 (93.2)
<i>Widowed or Divorced</i>	13 (6.8)
Occupational status	
<i>Employed</i>	35 (18.4)
<i>Unemployed</i>	155 (81.6)
Place of residence	
<i>Urban residents</i>	140 (73.7)
<i>Rural residents</i>	50 (26.3)
Medical insurance	
<i>Yes</i>	189 (99.5)
<i>No</i>	1 (0.5)
Family income(¥/m)	
<i>≤5000</i>	67 (35.3)
<i>5000-10000</i>	56 (29.5)
<i>≥10000</i>	67 (35.3)

Table 2. Disease and treatment characteristics (n=190)

Variables	n (%)
Diagnosis	
<i>Gastric cancer</i>	29 (29.0)
<i>Colorectal cancer</i>	23 (23.0)
<i>Esophageal cancer</i>	23(23.0)
<i>Esophagogastric junction cancer</i>	15 (15.0)
<i>Gallbladder/bile duct cancer</i>	7 (7.0)
<i>Others</i>	3 (3.0)
Stage	
<i>I</i>	2 (1.1)
<i>II</i>	16 (8.4)
<i>III</i>	151 (79.5)
<i>Unclear</i>	21 (11.1)
Comorbidities	
<i>Yes</i>	137 (72.1)
<i>No</i>	53 (27.9)
Complications	
<i>Yes</i>	56 (29.5)
<i>No</i>	134 (70.5)
Previous operation	
<i>Yes</i>	12 (63.7)
<i>No</i>	69 (36.3)
ECOG score	
<i>0</i>	30 (15.8)
<i>1</i>	65 (34.2)
<i>2</i>	43 (22.6)
<i>3</i>	30 (15.8)
<i>4</i>	6 (3.2)
<i>Missing</i>	16 (8.4)
Therapeutic scheme	

<i>Chemotherapy</i>	100 (52.6)
<i>Targeted therapy</i>	50 (26.3)
<i>Immunotherapy</i>	27 (14.2)
<i>No anti-tumor therapy</i>	69 (36.3)

Table 3. Score of CRAS-C and main constipation risk factors (n = 190)

Subscale/Item	<i>n (%)</i>	<i>Minimum</i>	<i>Maximum</i>	$\bar{x}\pm S/M$
Subscale 1		1.00	10.00	6.00
Gender				
<i>Male</i>	123 (64.7)			
<i>Female</i>	67 (35.3)			
Mobility				
<i>Independent mobile</i>	170 (89.5)			
<i>Dependent on walking aids/assistance from others</i>	10 (5.3)			
<i>Restricted to bed/chair</i>	9 (4.7)			
<i>Spinal cord injury/spinal cord compression</i>	1 (0.5)			
Fiber intake				
$\geq 500g$ fruits or vegetables/day	42 (22.1)			
200-500g fruits or vegetables/day	59 (31.1)			
$\leq 200g$ fruits or vegetables/day	89 (46.8)			
Bran products consumed daily				
Yes	40 (21.1)			
No	150 (78.9)			
Fluid intake				
$\geq 2000mL/day$	36 (18.9)			
1000-2000mL/day	68 (35.8)			
$\leq 1000mL/day$	86 (45.3)			
Subscale 2		0.00	2.00	0.00
Does patient have difficulty evacuating bowels in hospital toilets?				
No	178 (93.7)			
Yes	12 (6.3)			
Does patient anticipate problems using a commode or bedpan				
No	189 (99.5)			

Yes	1 (0.5)			
Subscale 3		0.00	9.00	3.00
Metabolic disorders				
Yes	4 (2.1)			
No	186 (97.9)			
Pelvic conditions				
Yes	12 (6.3)			
No	178 (93.7)			
Neuromuscular disorders				
Yes	6 (3.2)			
No	184 (96.8)			
Endocrine disorders				
Yes	27 (14.2)			
No	163 (85.8)			
Colorectal/abdominal disorder				
Yes	81 (42.6)			
No	109 (57.4)			
Psychiatric illness				
Yes	2 (1.1)			
No	188 (98.9)			
Learning disabilities or dementia				
Yes	1 (0.5)			
No	189 (99.5)			
Subscale 4		0.00	14.00	5.00
Antiemetics				
Yes	142 (74.7)			
No	48 (25.3)			
Calcium channel blockers				
Yes	31 (16.3)			
No	159 (83.7)			

Iron supplements				
Yes	14 (7.4)			
No	176 (92.6)			
Anticonvulsants				
Yes	11 (5.8)			
No	179 (94.2)			
Antidepressants				
Yes	5 (2.6)			
No	185 (97.4)			
Antiparkinson drugs				
Yes	0 (0.0)			
No	190(100.0)			
Antispasmodics				
Yes	5 (2.6)			
No	185 (97.4)			
Non-opioid analgesia				
Yes	12 (6.3)			
No	178 (93.7)			
Opioid analgesic				
Yes	51 (26.8)			
No	139 (73.2)			
Cytotoxic chemotherapy				
Yes	94 (49.5)			
No	96 (50.5)			
Vinca alkaloid agents				
Yes	0(0.0)			
No	190(100.0)			
Total score*		2.00	26.00	13.22±4.69

Table 4. Specific constipation risk factors in gastrointestinal cancer patients

	Constipation (%)	No constipation (%)	t/ χ^2	P
Age	61.28±11.76	57.80±12.10	1.868	0.063
Constipating for most of the past 3 months			78.168	□ 0.001**
Yes	43 (70.5)	11 (8.5)		
No	18 (29.5)	118 (91.5)		
Diagnosis			9.149	0.158
<i>Gastric cancer</i>	23 (37.7)	31 (24.0)		
<i>Colorectal cancer</i>	13 (21.3)	36 (27.9)		
<i>Esophageal cancer</i>	7 (11.5)	27 (20.9)		
<i>Pancreatic cancer</i>	7 (11.5)	13 (10.1)		
<i>Esophagogastric junction cancer</i>	5 (8.2)	7 (5.4)		
<i>Gallbladder/bile duct cancer</i>				
<i>Others</i>	1 (1.6)	9 (7.0)		
	5 (8.2)	6 (4.7)		
Stage			1.962	0.581
□	0 (0.0)	2 (1.6)		
□	3 (4.9)	13 (10.1)		
□	51 (83.6)	100 (77.5)		
<i>Unclear</i>	7 (11.5)	14 (10.9)		
Ascites			11.642	0.001**
Yes	15(24.6)	9 (7.0)		
No	46(75.4)	120 (93.0)		
ECOG			10.467	0.033*
0	4 (7.3)	26 (21.8)		
1	17 (30.9)	48 (40.3)		
2	18 (32.7)	25 (21.0)		
3	13 (23.6)	17 (14.3)		

4	3 (5.5)	3 (2.5)		
Gastrointestinal tumor operation			1.687	0.194
Yes				
No	26 (42.6)	68 (52.7)		
	35 (57.4)	61 (47.3)		

* $P \leq 0.05$ ** $P \leq 0.01$

Supplementary Files

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- [ChineseVersionconstipationriskassessmentscale.pdf](#)
- [Englishversionconstipationriskassessmentscale.pdf](#)