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# Disability, quality of life, and emotional problems within a few days after surgery in patients operated due to colorectal cancer in Poland

## Abstract

**Introduction:** The incidence of colorectal cancer (CRC) is increasing, and the assessment of the disability quality of life (QoL), and emotional problems in patients with this diagnosis should require more and more attention from both the physician and the nursing team. The study aimed to assess the disability, QoL, and emotional problems in patients operated due to CRC.

**Patients and methods:** One hundred six patients (men and women) above 60 years old in the first days after the abdominal surgery due to oncological or non-oncological reasons (control group) participated in the study. The disability was evaluated with the WHO-DAS II questionnaire (World Health Organization Disability Assessment Schedule II) and the QoL was measured with the EORTC QLQ-C30 questionnaire and EORTC QLQ-CR29 (colorectal module). General Health Questionnaire — 28 (GHQ-28) was used for non-specific mental suffering assessment and Eysenck Personality Questionnaire EPQ-R(S) was used to study basic personality dimensions. The results obtained from the questionnaires were statistically analyzed.

**Results:** Patients operated on due to CRC with stoma had a higher degree of disability, poorer QoL, and greater emotional problems compared to patients operated on for non-oncological reasons. The type of surgery had a significant impact on the assessed QoL. The patients operated with minimally invasive methods had the lowest degree of disability, the highest QoL, and the lowest emotional problems compared to patients operated using the classical methods.

**Conclusions:** Physical and especially emotional disability of patients operated on due to CRC should be recognized in the hospital and appropriate psychological support should be initiated during hospitalization and continued at home to improve the QoL of this group of patients.

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**Keywords:** colorectal cancer (CRC), quality of life (QoL), mental disorders

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## Introduction

In Poland, malignant tumors are one of the most common causes of death, just behind cardiovascular diseases [1]. As many as 16,000 people will get colorectal cancer (CRC) every year in Poland [1]. According to the prognosis for morbidity, the incidence of colon cancer in 2025 will increase even twice [1].

Due to delayed diagnosis, a 5-year survival rate amounts to only 20%. The treatment includes surgery: classic surgical operations or laparoscopy, adjuvant chemotherapy, and radiation therapy; however, it is burdened with many side effects [2–4]. Such poor treatment results are greatly influenced by patient's late-stage reporting. Unfortunately, in the initial phase, the disease is often asymptomatic. Therefore, the preventive colonoscopy should be performed once every 10 years in patients above 50 years old [5].

Quality of life (QoL) is a multidimensional concept, covering the physical, mental, and social spheres. Recognizing problems in these areas and dealing with them is an essential part of both treatment and patient care. Reducing their impact or eliminating them significantly accelerates the recovery period after surgery [6, 7].

Due to the often late diagnosis of CRC and the associated poor prognosis, attention should be paid to the patient's quality of life. The identification of factors that improvement should lead to better patient functioning is the overarching goal.

Many factors significantly determine the QoL in patients with CRC. First of all, patients with CRC suffer from several symptoms associated with malignant disease, such as negative gastrointestinal symptoms, malnutrition, and chronic fatigue. Secondly, the type of implemented therapy, especially the need to create a stoma and subsequent difficulties in using the stoma, also significantly deteriorates the QoL [8]. Moreover, socioeconomic conditions and psychological stress associated with the diagnosis of life-threatening cancer disease may be related to emotional problems in these patients [9–11]. It is worth mentioning that the patient's personality may influence the perception of the disease.

Neuroticism is a trait that is connected with experiencing negative emotions, such as depression, anxiety, nervousness, tension, anger, negative self-image, and a sense of rejection [12]. Neuroticism is a stable personality trait, which means that the intensity of this personal feature is a constant value for a given person and does not depend on the presence of a somatic disease [12]. Neuroticism together with life adversity such as stressful life events (SLE) or long-term diffi-

culties (LTD) correlates with the severity of depressive symptoms in a single patient [13–16].

Some authors have pointed out that the assessment of the QoL based on physiological functioning is insufficient, pointing out that a psychological and social dimension is also needed. In the postoperative period, various determinants influence the QoL to varying degrees. In the later stages, the QoL is influenced to a greater extent by psychosocial factors than by physiological factors, which dominate in the initial postoperative period [17, 18].

The purpose of the present study was to assess disability, QoL, and psychological status in patients with CRC shortly after the surgery treated with different surgical methods, including the comparison of patients with and without a stoma.

Despite the plethora of articles addressing the assessment of QoL in patients with colorectal cancer, the following work is distinguished by the short time after surgery in which the participants were assessed, and counted in days after the surgery. An additional aspect is the comparison of disability, QoL, and psychological status in patients with and without a stoma and using a questionnaire comparing personality traits that can also affect self-reported distress associated with malignant disease, e.g., a high degree of neuroticism [19]. Only a few studies were found in assessing the QoL a few days after surgery in the available literature. However, previous studies did not analyze personality traits, and different instruments for evaluating self-reported health status were used [20–22].

## Patients and methods

### Patients

One hundred six patients (men and women) over 60 years of age (F/M, 50/56; mean age  $64 \pm 8$  years) in the first days after abdominal surgery participated in the study. Respondents were divided into 4 subgroups, due to the indications for and the type of the surgery. The first subgroup consisted of patients with CRC, operated using the classical method, without a stoma (30 patients). The second subgroup consisted of patients with colorectal cancer with a stoma (15 patients). The third subgroup consisted of patients without CRC, operated with a classical method (30 patients). The fourth subgroup consisted of patients without CRC operated using minimally invasive methods (31 patients).

Inclusion criteria included: age > 60 years old, and patients without early postoperative complications. Exclusion criteria: patients being operated on > 5 days before completing the questionnaires, a history of colorectal cancer surgery. The patients

were hospitalized in the three oncology surgery centers in Wrocław and Lubin, Poland.

Participation in this study was voluntary. The study was conducted as a part of the master's thesis. All the patients gave written informed consent before the study. To ensure patients' well-being and comfort, the subject selection criteria included patients whose post-operative clinical status allowed them to be interviewed and complete the questionnaires used in the study. Therefore, only the patients with normal cognitive function who could communicate, understand the purpose of the research and agree in writing participated in the study. Medical characteristics of the study groups, including gender, age, body mass index (BMI), the indications for the surgery treatment, and comorbidities are presented in Table 1.

### Questionnaires

Patients completed the following questionnaires: WHO-DAS II questionnaire (World Health Organization Disability Assessment Schedule II), a questionnaire for assessing the quality of life of people with cancer (EORTC QLQ-C30), questionnaire for assessing the quality of life of people suffering from colorectal cancer (EORTC QLQ-CR29), General Health Questionnaire-28 (GHQ-28) used for non-specific mental suffering assessment and Eysenck Personality Questionnaire [EPQ-R(S)], used to study basic personality dimensions.

The WHO-DAS II questionnaire, a 36-item self-administered version, developed by the World Health Organization (WHO), is used to assess the level of disability in the following six aspects: understanding and communicating (DAS1), getting around (DAS2), self-care (DAS3), getting along with people (DAS4), life activities (DAS5) and participation in society (DAS6). In addition, the WHO-DAS II questionnaire includes health questions (H1 domain) and questions about disability in everyday and professional activity (H2–H5 domains). The sum of the points from each subscale is the overall disability score (DAS). High scores indicate a high level of disability [23].

The EORTC QLQ-C30 questionnaire consists of the following scales: the scale of the general quality of life, five scales of functioning: physical (PF), social roles (RF), cognitive functioning (CF), emotional (EF) and social functioning (SF), three subscales symptoms: pain (PA), fatigue (FA), nausea/vomiting (NV), five individual questions about the following ailments: insomnia (SL), shortness of breath (DY, dyspnoea), loss of appetite (AP), constipation (CO), diarrhea (DI), financial problems (FI). High scores indicate a high quality of life [24, 25].

The EORTC QLQ-CR29 questionnaire consists of five operating scales: body image (BI), anxiety (ANX), body weight (WEI), interest in sexual issues in men

and women (SEXM AND SEXW), and eighteen items concerning typical colorectal cancer symptoms. High scores indicate a high quality of life [26].

The GHQ-28 questionnaire contains 28 questions. It is used to assess present mental well-being and stress detection. High scores indicate a high level of mental disorders [27, 28].

Eysenck Personality Questionnaire, EPQ-R(S) is a questionnaire to assess the personality characteristics of patients. The questionnaire allows for the assessment of neuroticism, psychoticism, extraversion, and lie/social desirability [29, 30]. The results obtained from the questionnaires were subjected to statistical analysis.

### Statistical methods

The subgroups differed in terms of age, sex, BMI, and at the time of completing the questionnaires after surgery. Therefore, when comparing subgroups in terms of individual questionnaire scales, the impact of these 4 parameters on the results of individual scales was considered. Effects of different variables on disability level (DAS), quality of life (QOL), general psychological distress (GHQ), and the Eysenck Personality Questionnaire (EPQ) were assessed with the general linear model method ANCOVA. Statistical analyses were done using Statistica for Windows, version 12.0; p-values < 0.05 were considered statistically significant. Effects of different variables on disability level (DAS), quality of life (QOL), and general psychological distress (GHQ) were assessed with general linear model methods: ANOVA.

### Results

Demographic and health-related parameters of all study subgroups are presented in Table 1. The overall disability score (DAS), global quality of life (QOL), and psychological distress (GHQ) differed significantly among the study groups. The subgroup with CRC and stoma had significantly the highest degree of disability, the lowest QoL, and the greatest emotional problems compared to patients operated on with non-oncological minimally invasive methods.

#### WHO-DAS II

All domains of the WHO-DAS II questionnaire, such as: understanding and communicating (DAS1), getting around (DAS2), self-care (DAS3), getting along with people (DAS4), life activities (DAS5) and participation in society (DAS6) were significantly higher in the subgroup number two than in the other subgroups. The fourth subgroup with non-oncological patients operated using minimally invasive methods showed the

Table 1. Basic demographic and health-related parameters for study subjects

Parameter		Group				p-value
		Study group	Subgroup with colorectal cancer and stoma (n = 15)	Subgroup without colorectal cancer, operated with the classical method (n = 30)	Subgroup without colorectal cancer, operated with laparoscopy (n = 31)	
		Mean ( $\pm$ SD)				
<b>Age (years)</b>		63.7 ( $\pm$ 1.39)	69.60 ( $\pm$ 1.96)	66.60 ( $\pm$ 1.39)	59.61 ( $\pm$ 1.36)	< 0.0002
<b>BMI [kg/m<sup>2</sup>]</b>		25.77 ( $\pm$ 0.57)	25.49 ( $\pm$ 0.89)	32.49 ( $\pm$ 0.64)	27.96 ( $\pm$ 0.60)	< 0.00001
<b>Gender</b>	Women	12 (40%)	9 (60%)	14 (46.67%)	15 (48.39%)	
	Men	18 (60%)	6 (40%)	16 (53.33%)	16 (51.61%)	
<b>Day after surgery</b>	First	1 (3.33%)	1 (6.67%)	6 (20.00%)	24 (77.42%)	< 0.00001
	Second	8 (26.67%)	0 (0.00%)	16 (53.33%)	7 (22.58%)	
	Third	13 (43.33%)	5 (33.33%)	7 (23.33%)	0 (0.00%)	
	Fourth	4 (13.33%)	7 (46.67%)	1 (3.33%)	0 (0.00%)	
	Fifth	4 (13.33%)	2 (13.33%)	0 (0.00%)	0 (0.00%)	
<b>Surgery reason</b>	Colorectal cancer	30 (100%)	15 (100%)			
	Cholecystitis			10 (33%)	17 (57%)	
	Abdominal hernia			8 (27%)	13 (43%)	
	Gastrointestinal bleeding			6 (20%)		
	Appendicitis			2 (7%)		
	Bowel obstruction			2 (7%)		
	Splenectomy			1 (3%)		
	Acute pancreatitis			1 (3%)		
<b>Comorbidities</b>	Hypertension	13 (43%)	6 (40%)	15 (50%)	7 (23%)	
	Atherosclerosis	10 (33%)	4 (27%)	4 (13%)		
	Diabetes	9 (30%)	2 (13%)	7 (23%)	2 (7%)	
	Ischemic heart disease	5 (17%)	1 (7%)	1 (3%)		
	Stroke	2 (7%)	3 (20%)	1 (3%)		
	Heart failure	1 (3%)				
	Atrial fibrillation	1 (3%)				
	Peripheral artery disease	1 (3%)				
	Varicose veins				3 (10%)	
	Deep vein thrombosis		1 (7%)	2 (7%)		
	Chronic obstructive pulmonary disease		1 (7%)	1 (3%)		
	Kidney failure	1 (3%)				
	Stomach ulcer		1 (7%)	2 (7%)		
	Crohn disease	1 (3%)				
	Hypothyreosis	1 (3%)	1 (7%)	1 (3%)	2 (7%)	
	Lupus	1 (3%)				
	Sjorgen disease	1 (3%)				
	Osteoarthritis		1 (7%)	1 (3%)		
	Hip endoprosthesis		2 (7%)			

BMI — body mass index; SD (*standard deviation*) — odchylenie standardowe

Table 2. Mean values, standard deviation, and statistics for WHO-DAS II in four subgroups of patients

Parameter	Group				f-value	p-value
	Study group		Control group			
	Subgroup with colorectal cancer without stoma (n = 30)	Subgroup with colorectal cancer and stoma (n = 15)	Subgroup without colorectal cancer, operated with the classical method (n = 30)	Subgroup without colorectal cancer, operated with laparoscopy (n = 31)		
	Mean ( $\pm$ SD)					
Understanding and communicating (DAS 1)	0.49 ( $\pm$ 0.03)	0.60 ( $\pm$ 0.08)	0.40 ( $\pm$ 0.03)	0.35 ( $\pm$ 0.02)	3.23	< 0.03*
Getting around (DAS 2)	0.72 ( $\pm$ 0.03)	0.89 ( $\pm$ 0.06)	0.59 ( $\pm$ 0.04)	0.47 ( $\pm$ 0.03)	4.43	< 0.01*
Self-care (DAS 3)	0.68 ( $\pm$ 0.05)	0.84 ( $\pm$ 0.08)	0.38 ( $\pm$ 0.03)	0.37 ( $\pm$ 0.02)	8.41	< 0.0008*
Getting along with people (DAS 4)	0.57 ( $\pm$ 0.03)	0.71 ( $\pm$ 0.08)	0.37 ( $\pm$ 0.02)	0.35 ( $\pm$ 0.02)	6.00	< 0.001*
Life activities at home (DAS 5)	0.73 ( $\pm$ 0.04)	0.83 ( $\pm$ 0.07)	0.56 ( $\pm$ 0.04)	0.45 ( $\pm$ 0.03)	3.07	< 0.034*
Participating in society (DAS 6)	0.58 ( $\pm$ 0.03)	0.71 ( $\pm$ 0.05)	0.43 ( $\pm$ 0.03)	0.33 ( $\pm$ 0.02)	9.15	< 0.00004*
Overall disability score (DAS)	0.62 ( $\pm$ 0.03)	0.76 ( $\pm$ 0.06)	0.45 ( $\pm$ 0.02)	0.39 ( $\pm$ 0.02)	8.27	< 0.00009*
General health (DAS H1)	3.67 ( $\pm$ 0.18)	3.82 ( $\pm$ 0.26)	2.62 ( $\pm$ 0.16)	2.09 ( $\pm$ 0.14)	7.53	< 0.0002*

\* Statistically significant; SD (*standard deviation*) — odchylenie standardowe

lowest disability. BMI value was a factor affecting the DAS 1 score (understanding and communicating,  $F = 7.80$ ;  $p = 0.007$ ). The results of the WHO-DAS II questionnaire are presented in Table 2.

### EORTC QLQ-C30

In the QLQ-C30 assessment, dyspnea (DY), financial difficulties (FI), and constipation (CO) were found to be more common in the first subgroup. Other parameters assessed in the EORTC QLQ-C30 were most common in the second subgroup. The best results were achieved by the fourth subgroup. Gender was a factor influencing emotional functioning (EF,  $F = 7.36$ ;  $p = 0.008$ ). Age was the factor influencing the occurrence of constipation (CO,  $F = 9.06$ ;  $p = 0.004$ ). The results of the EORTC QLQ-C30 are presented in Table 3 and Table 4.

### EORTC QLQ-CR29

The assessment of the QLQ-CR29 functioning scale showed the lowest results in the second subgroup, except for body weight (WEI), which was the lowest in the first subgroup. The best results were achieved by the fourth subgroup. The assessment of eighteen cancer items for typical colon symptoms also gave the same results except for BMS (blood and mucus in the stool), AP (abdominal pain), HL (hair loss), IMP

(impotence), and SS (skin pain). Gender was a factor influencing body image (BI;  $F = 5.81$ ;  $p = 0.019$ ) and dry mouth (DM;  $F = 5.47$ ;  $p = 0.022$ ). The day after the surgery was a factor influencing dry mouth (DM;  $F = 2.73$ ;  $p = 0.03$ ) and stoma problems (STO;  $F = 2.69$ ;  $p = 0.03$ ). The results of the QLQ-CR29 questionnaire are presented in Table 5 and Table 6.

### GHQ-28

The subgroups differed statistically significantly in both, the overall result (GHQ) and all subscales of the questionnaire. The highest scores were achieved by the second subgroup. The lowest values in the GHQ-28 questionnaire were obtained by the fourth subgroup. Gender was a factor influencing the GHQ-A (somatic symptoms;  $F = 6.85$ ;  $p = 0.011$ ). The results of the GHQ-28 questionnaire are presented in Table 7.

### EPQ-R

The EPQ-R questionnaire showed no significant differences among the study subgroups. The results of the EPQ-R questionnaire are presented in Table 8.

## Discussion

Assessment of all the questionnaires used in the present study (WHO-DAS II, EORTC QLQ-C30, GHQ-28,

**Table 3. Mean values, standard deviation, and statistics for EORTC QLQ 30 (functional scales) in four subgroups of patients**

Parameter	Group				f-value	p-value
	Study group		Control group			
	Subgroup with colorectal cancer without stoma (n = 30)	Subgroup with colorectal cancer and stoma (n = 15)	Subgroup without colorectal cancer, operated with the classical method (n = 30)	Subgroup without colorectal cancer, operated with laparoscopy (n = 31)		
	Mean (± SD)					
Physical functioning (PF)	55.73 (± 4.60)	41.21 (± 6.66)	81.00 (± 2.91)	88.61 (± 2.14)	9.23	< 0.00003*
Role functioning (RF)	36.67 (± 5.53)	24.24 (± 8.81)	51.67 (± 4.17)	70.14 (± 4.01)	8.38	< 0.00008*
Emotional functioning (EF)	51.67 (± 3.33)	46.21 (± 6.68)	79.58 (± 4.17)	82.64 (± 3.36)	7.49	< 0.0002*
Cognitive functioning (CF)	64.00 (± 4.27)	62.12 (± 8.13)	83.33 (± 3.63)	89.58 (± 2.80)	3.58	< 0.018*
Social functioning (SF)	47.33 (± 5.33)	40.91 (± 8.81)	78.33 (± 4.38)	87.50 (± 2.88)	6.72	< 0.0005*

\* Statistically significant; SD (standard deviation) — odchylenie standardowe

**Table 4. Mean values, standard deviation, and statistics for EORTC QLQ 30 (symptom scales) in four subgroups of patients**

Parameter	Group				f-value	p-value
	Study group		Control group			
	Subgroup with colorectal cancer without stoma (n = 30)	Subgroup with colorectal cancer and stoma (n = 15)	Subgroup without colorectal cancer, operated with the classical method (n = 30)	Subgroup without colorectal cancer, operated with laparoscopy (n = 31)		
	Mean (± SD)					
Fatigue (FA)	60.00 (± 3.39)	60.61 (± 5.87)	28.89 (± 4.06)	18.98 (± 2.72)	10.57	< 0.00001*
Pain (PA)	54.67 (± 3.79)	62.12 (± 8.44)	43.33 (± 5.33)	31.25 (± 4.05)	2.69	< 0.053
Dyspnea (DY)	40.00 (± 3.33)	39.39 (± 8.78)	20.00 (± 6.12)	2.78 (± 1.92)	4.42	< 0.0067*
Insomnia (SL)	53.33 (± 4.71)	54.55 (± 10.32)	21.67 (± 5.00)	19.44 (± 5.65)	6.65	< 0.0005*
Appetite loss (AP)	61.33 (± 5.33)	72.73 (± 9.87)	25.00 (± 5.86)	12.50 (± 3.92)	8.08	< 0.0001*
Nausea/vomiting (NV)	34.00 (± 4.35)	51.52 (± 8.83)	15.00 (± 3.61)	8.33 (± 2.24)	6.69	< 0.0005*
Constipation (CO)	52.00 (± 6.69)	39.39 (± 12.57)	6.67 (± 3.06)	8.33 (± 3.01)	10.08	< 0.00001*
Diarrhea (DI)	10.67 (± 4.18)	12.12 (± 9.29)	10.00 (± 4.26)	5.56 (± 2.59)	0.44	0.73
Financial problems (FI)	32.00 (± 5.26)	24.24 (± 6.50)	8.33 (± 4.10)	0.00 (± 0.00)	6.37	< 0.0007*

\* Statistically significant; SD (standard deviation) — odchylenie standardowe

and the GHQ-A scale — somatic disorders) have revealed higher physical disability in the oncological groups of patients. The present study indicated the numerous physical problems present in the first days after surgery, including difficulty in moving, taking care of oneself, and various clinical symptoms from the

digestive tract, such as a loss of appetite, nausea, and vomiting, constipation, pain, body weight, buttock pain, flatulence, dry mouth, taste disturbance, frequency of passing stools and stool incontinence. The physical problems were two to three times more frequent in patients with CRC in contrast to non-oncological



**Table 5. Mean values, standard deviation, and statistics for EORTC QLQ-CR29 (functional scales) in four subgroups of patients**

Parameter	Group				f-value	p-value
	Study group Subgroup with colorectal cancer without stoma (n = 30)	Subgroup without colorectal cancer, operated with the classical method (n = 30)	Control group Subgroup with colorectal cancer and stoma (n = 15)	Subgroup without colorectal cancer, operated with laparoscopy (n = 31)		
	Mean ( $\pm$ SD)					
Body image (BI)	57.33 ( $\pm$ 4.43)	35.35 ( $\pm$ 8.84)	90.06 ( $\pm$ 3.28)	92.27 ( $\pm$ 2.26)	12.59	< 0.00001*
Anxiety (ANX)	37.33 ( $\pm$ 4.84)	24.24 ( $\pm$ 6.50)	75.44 ( $\pm$ 5.61)	81.16 ( $\pm$ 4.10)	9.85	< 0.00002*
Weight (WEI)	58.67 ( $\pm$ 5.54)	63.64 ( $\pm$ 8.35)	87.72 ( $\pm$ 4.47)	95.65 ( $\pm$ 2.39)	5.95	< 0.0012*
Sexual functioning — men (SEXM)	75.93 ( $\pm$ 3.62)	86.67 ( $\pm$ 8.16)	74.36 ( $\pm$ 6.70)	55.56 ( $\pm$ 5.56)	2.36	0.087
Sexual functioning — women (SEXW)	83.33 ( $\pm$ 6.30)	100.00 ( $\pm$ 0.00)	85.71 ( $\pm$ 6.73)	80.00 ( $\pm$ 5.44)	1.01	0.41

\* Statistically significant; SD (*standard deviation*) — odchylenie standardowe

patients. Physical disability was also consistently more significant in the group with a stoma than in cancer patients treated with a non-invasive method.

It was documented that CRC may result in many physical and psychological symptoms also in the longer postoperative period. They may be very burdensome for patients and significantly affect their QoL. Although problems and symptoms are most evident in the first three years, long-term effects of oncological treatment may persist and include fatigue, difficulty sleeping, fear of relapse, anxiety, depression, negative body image, sensory neuropathy, gastrointestinal problems, incontinence, urine, and sexual dysfunctions [31]. Colorectal cancer survivors more than ten years after the diagnosis reported significantly worse deficits when intestinal dysfunction was present [32]. A recent cohort study pointed to minimally invasive surgical techniques over open colectomy in subsequent QoL in patients [33].

The present study also showed significantly greater emotional problems in oncological groups of patients compared to groups operated because of non-oncological reasons in all the questionnaires used in the study (EORTC QLQ-C30, EORTC QLQ-CR29, GHQ-28). The study groups did not differ in neuroticism traits. Therefore, the difference in the emotional problems among the study groups did not result from the differences in vulnerability to distress related to the personality of the study participants [13–16]. The present results are in agreement with the results of other studies. People with CRC are at risk of insomnia, anxiety, fatigue, and depression. Sleep disorders may result from anxiety, which is common

in oncological patients [34]. Moreover, insomnia before chemotherapy may increase susceptibility to show immune alterations and develop chemotherapy-induced infections during the trajectory of cancer treatment [35]. Anxiety symptoms occur in the majority of cancer patients at every stage of cancer [36, 37]. Depressive disorders are among the most common psychiatric complications in cancer [37, 38]. However, depression in cancer patients may be modifiable [39]. Recent studies have shown that women with cancer suffer from more anxiety symptoms than men with cancer [38]. It was also demonstrated that participation in social life and maintaining physical activity bring a higher level of physical and mental health in survivors of CRC [40, 41]. Beliefs about the disease are also fundamental [39]. It can be assumed that a stoma causes a lack of self-acceptance and unpleasant mental experiences and, in a straight line, may lead to depression [9]. One year after the stoma was selected, the patients became more independent in its use [42]. Patients with CRC with social support and functionally independent have a higher QoL [43]. Exercise is also an essential therapeutic option in reducing cancer-related fatigue [44].

The present study indicates that a psychologist's care is essential for a patient with CRC. Psychological monitoring of patients during hospitalization and after discharge can contribute to improving their QoL. Regular screening for psychosocial problems and the exchange of information on psychosocial functioning between different healthcare professionals are essential during the treatment and follow-up trajectory of CRC patients.

**Table 6. Mean values, standard deviation, and statistics for EORTC QLQ-CR29 (symptoms scales) in four subgroups of patients**

Parameter	Group				f-value	p-value
	Study group	Control group				
	Subgroup with colorectal cancer without stoma (n = 30)	Subgroup with colorectal cancer and stoma (n = 15)	Subgroup without colorectal cancer, operated with the classical method (n = 30)	Subgroup without colorectal cancer, operated with laparoscopy (n = 31)		
	Mean ( $\pm$ SD)					
Urinary frequency (UF)	46.67 ( $\pm$ 4.51)	46.97 ( $\pm$ 8.65)	32.46 ( $\pm$ 3.92)	34.78 ( $\pm$ 2.76)	0.93	0.43
Blood and mucus in stool (BMS)	20.67 ( $\pm$ 4.44)	16.67 ( $\pm$ 6.36)	5.26 ( $\pm$ 3.14)	2.90 ( $\pm$ 2.26)	0.80	0.50
Stool frequency (SF)	12.00 ( $\pm$ 2.97)	0.00	18.42 ( $\pm$ 3.35)	15.79 ( $\pm$ 2.70)	6.22	< 0.0009*
Urinary incontinence (UI)	9.33 ( $\pm$ 3.06)	24.24 ( $\pm$ 6.50)	7.02 ( $\pm$ 3.20)	5.80 ( $\pm$ 2.69)	1.40	0.25
Dysuria (DY)	12.00 ( $\pm$ 4.25)	18.18 ( $\pm$ 6.91)	3.51 ( $\pm$ 2.41)	10.14 ( $\pm$ 3.27)	2.40	0.076
Abdominal pain (AP)	50.67 ( $\pm$ 4.76)	69.70 ( $\pm$ 8.35)	56.14 ( $\pm$ 5.73)	33.33 ( $\pm$ 5.13)	4.75	< 0.005*
Buttock pain (BP)	45.33 ( $\pm$ 6.05)	57.58 ( $\pm$ 11.09)	1.75 ( $\pm$ 1.75)	1.45 ( $\pm$ 1.45)	9.21	< 0.00004*
Bloated feeling (BF)	48.00 ( $\pm$ 5.47)	75.76 ( $\pm$ 10.14)	28.07 ( $\pm$ 6.38)	21.74 ( $\pm$ 4.96)	5.20	< 0.028*
Dry mouth (DM)	46.67 ( $\pm$ 5.44)	69.70 ( $\pm$ 7.04)	33.33 ( $\pm$ 6.24)	24.64 ( $\pm$ 4.79)	3.04	< 0.035*
Hair loss (HL)	54.67 ( $\pm$ 4.25)	48.48 ( $\pm$ 8.24)	42.11 ( $\pm$ 4.30)	49.28 ( $\pm$ 4.12)	1.37	0.26
Trouble with taste (TA)	22.67 ( $\pm$ 5.35)	57.58 ( $\pm$ 9.09)	8.77 ( $\pm$ 4.30)	8.70 ( $\pm$ 3.12)	5.49	< 0.002*
Flatulence (FL)	29.33 ( $\pm$ 4.44)	0.00 ( $\pm$ 0.00)	10.53 ( $\pm$ 3.65)	5.00 ( $\pm$ 2.73)	10.62	< 0.00001*
Faecal incontinence (FI)	14.67 ( $\pm$ 3.89)	0.00 ( $\pm$ 0.00)	3.51 ( $\pm$ 2.41)	0.00 ( $\pm$ 0.00)	4.97	< 0.004*
Sore skin (SS)	26.67 ( $\pm$ 4.30)	3.03 ( $\pm$ 3.03)	8.77 ( $\pm$ 4.30)	0.00 ( $\pm$ 0.00)	10.25	< 0.00001*
Embarrassment (EMB)	4.00 ( $\pm$ 9.29)	54.55 ( $\pm$ 11.25)	8.77 ( $\pm$ 5.61)	0.00 ( $\pm$ 0.00)	7.37	< 0.0002*
Stoma care problems (STO)	0.00 ( $\pm$ 0.00)	45.45 ( $\pm$ 11.26)	0.00 ( $\pm$ 0.00)	0.00 ( $\pm$ 0.00)	21.11	< 0.00001*
Impotence (IMP)	29.63 ( $\pm$ 8.89)	26.67 ( $\pm$ 12.47)	15.15 ( $\pm$ 8.24)	22.22 ( $\pm$ 7.86)	0.40	0.75
Dyspareunia (DYS)	4.17 ( $\pm$ 4.17)	0.00 ( $\pm$ 0.00)	9.52 ( $\pm$ 9.52)	6.67 ( $\pm$ 4.44)	0.15	0.93

\* Statistically significant; SD (*standard deviation*) — odchylenie standardowe



Table 7. Mean values, standard deviation, and statistics for GHQ 28 in four subgroups of patients

Parameters	Group				f-value	p-value
	Study group	Control group				
	Subgroup with colorectal cancer without stoma (n = 30)	Subgroup with colorectal cancer and stoma (n = 15)	Subgroup without colorectal cancer, operated with the classical method (n = 30)	Subgroup without colorectal cancer, operated with laparoscopy (n = 31)		
	Mean ( $\pm$ SD)					
GHQ-A	3.89 ( $\pm$ 0.29)	3.90 ( $\pm$ 0.41)	1.25 ( $\pm$ 0.37)	0.87 ( $\pm$ 0.18)	10.81	< 0.00001*
GHQ-B*	3.70 ( $\pm$ 0.30)	5.90 ( $\pm$ 0.38)	0.90 ( $\pm$ 0.37)	0.35 ( $\pm$ 0.16)	20.93	< 0.00001*
GHQ-C*	2.93 ( $\pm$ 0.34)	4.60 ( $\pm$ 0.56)	0.65 ( $\pm$ 0.32)	0.07 ( $\pm$ 0.06)	14.85	< 0.00001*
GHQ-D*	1.44 ( $\pm$ 0.34)	1.90 ( $\pm$ 0.50)	0.10 ( $\pm$ 0.07)	0.09 ( $\pm$ 0.06)	4.27	< 0.008*
GHQ	11.96 ( $\pm$ 1.03)	16.30 ( $\pm$ 1.51)	2.90 ( $\pm$ 0.93)	1.39 ( $\pm$ 0.29)	17.93	< 0.00001*

\* Statistically significant; GHQ-A — somatic symptoms; GHQ-B — anxiety and insomnia; GHQ-C — social dysfunction; GHQ-D — depression; SD (*standard deviation*) — odchylenie standardowe

Table 8. Mean values and statistical data of the Eysenck personality questionnaire

Personality trait	Group				f-value	p-value
	Study group	Control group				
	Subgroup with colorectal cancer without stoma (n = 30)	Subgroup with colorectal cancer and stoma (n = 15)	Subgroup without colorectal cancer, operated with classical method (n = 30)	Subgroup without colorectal cancer, operated with laparoscopy (n = 31)		
	Mean ( $\pm$ SD)					
Psychoticism	4.60 (0.19)	4.67 (0.24)	4.70 (0.25)	4.48 (0.19)	0.15	0.93
Extraversion	6.89 (0.42)	7.22 (0.60)	8.10 (0.47)	8.43 (0.47)	0.45	0.72
Neuroticism	7.40 (0.35)	7.00 (0.69)	6.55 (0.47)	5.52 (0.42)	0.93	0.43
Lie	6.60 (0.40)	6.22 (0.50)	6.60 (0.43)	5.62 (0.36)	1.13	0.34

\* Statistically significant; SD (*standard deviation*) — odchylenie standardowe

## Conclusions

1. Patients with CRC have a greater degree of disability, poorer quality of life, and greater emotional problems compared to patients operated for non-oncological reasons.
2. The highest degree of disability, the lowest QoL, and the greatest emotional problems have patients with a stoma.
3. The type of surgery has a significant impact on the assessed QoL. Patients operated on using minimally invasive methods have the lowest degree of disability, the highest QoL, and the lowest emotional problems compared to patients operated on using the classical methods.
4. Patients with a stoma reported significantly more often both physical and emotional problems.

## Article information and declarations

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None.

### Data availability statement

Data is available from the first author.

### Ethics statement

The study benefited from the general approval of the Bioethics Committee established by the Medical University of Wrocław for this type of research. No separate consent was required.

### Author contributions

Conception — KD, KK, AC, AS; design — KK, KD, AS; execution — KK, KD, AC; interpretation of the data

being published — KM, AT, JB; writing the paper — KD, KK; preparing the manuscript — AT, JB.

### Conflict of interest

All authors declare that they have no conflicts of interest

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### Supplementary material

None.

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