

Impact of Colorectal Surgery on Functional Performance and Self-Perceived Health of Patients with Cancer

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Impacto da Cirurgia Colorretal no Desempenho Funcional e Autopercepção de Saúde de Pacientes com Doença Oncológica
Impacto de la Cirugía Colorrectal en el Desempeño Funcional y la Salud Autopercebida de Pacientes con Cáncer

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ABSTRACT

Introduction: Colorectal cancer is one of the leading causes of mortality in Brazil, and surgical treatment can impact the functional performance and self-perception of health of the patients. **Objective:** To analyze the impact of colorectal cancer surgery on the functional performance and self-perception of health of patients with oncological disease. **Method:** Descriptive and cross-sectional study with a quantitative approach conducted between October 2024 and April 2025, with a non-probabilistic convenience sample composed of patients diagnosed with colorectal cancer. Functional tests were applied, including assessment of functional performance status, risk of sarcopenia, gait speed, sit-to-stand test, and a questionnaire on self-perception of health, pre- and post-operatively. Statistical analysis was performed using the Shapiro-Wilk test and, given the non-normal distribution of variables, the non-parametric Wilcoxon test was used for comparison between the evaluated moments. **Results:** The sample consisted of 24 patients, predominantly males and with low educational attainment. Changes were observed in functional performance status [0.00 (0.00–0.75) vs. 1.00 (0.00–1.00); $p<0.001$] and in sarcopenia risk score [0.00 (0.00–11.00) vs. 0.00 (2.00–11.00); $p=0.012$]. There were no significant differences in the other variables assessed, including handgrip strength, gait speed, sit-to-stand test, and self-perceived health. **Conclusion:** There was a change in functional performance and sarcopenia risk in the postoperative period, while the other variables remained stable, reinforcing the importance of rehabilitation strategies in the care of these patients.

Key words: Colorectal Neoplasms/surgery; Colorectal Surgery; Sarcopenia; Functional Status.

RESUMO

Introdução: O câncer colorretal é uma das principais causas de mortalidade no Brasil, e o tratamento cirúrgico pode impactar o desempenho funcional e a autopercepção de saúde dos pacientes. **Objetivo:** Analisar o impacto da cirurgia de câncer colorretal no desempenho funcional e na autopercepção de saúde de pacientes com doença oncológica. **Método:** Estudo descritivo e transversal, com abordagem quantitativa, realizado entre outubro de 2024 e abril de 2025, com amostra de conveniência não probabilística composta por pacientes diagnosticados com câncer colorretal. Foram aplicados testes funcionais, incluindo avaliação do status de desempenho funcional, risco de sarcopenia, velocidade da marcha, teste de sentar e levantar e questionamento sobre autopercepção de saúde, no pré e pós-operatório. A análise estatística foi realizada pelo teste de Shapiro-Wilk e, diante da distribuição não normal das variáveis, utilizou-se o teste não paramétrico de Wilcoxon para a comparação entre os momentos avaliados. **Resultados:** A amostra foi composta por 24 pacientes, com predomínio do sexo masculino e baixa escolaridade. Observou-se alteração no status de desempenho funcional [0,00 (0,00–0,75) vs. 1,00 (0,00–1,00); $p<0,001$] e no escore de risco de sarcopenia [0,00 (0,00–11,00) vs. 0,00 (2,00–11,00); $p=0,012$]. Não houve diferenças significativas nas demais variáveis avaliadas, incluindo força de preensão palmar, velocidade da marcha, teste de sentar e levantar e autopercepção de saúde. **Conclusão:** Houve alteração no desempenho funcional e no risco de sarcopenia no período pós-operatório, enquanto as demais variáveis permaneceram estáveis, reforçando a importância de estratégias de reabilitação no cuidado desses pacientes.

Palavras-chave: Neoplasias Colorretais/cirurgia; Cirurgia Colorretal; Sarcopenia; Estado Funcional.

RESUMEN

Introducción: El cáncer colorrectal es una de las principales causas de mortalidad en el Brasil, y el tratamiento quirúrgico puede afectar el desempeño funcional y la autopercepción de la salud de los pacientes. **Objetivo:** Analizar el impacto de la cirugía de cáncer colorrectal en el desempeño funcional y la autopercepción de la salud de pacientes con enfermedad oncológica. **Método:** Estudio descriptivo y transversal con enfoque cuantitativo, realizado entre octubre de 2024 y abril de 2025, con una muestra de conveniencia no probabilística compuesta por pacientes con cáncer colorrectal. Se aplicaron pruebas funcionales, incluyendo evaluación del estado del desempeño funcional, riesgo de sarcopenia, velocidad de marcha, prueba de sentarse y levantarse y autopercepción de la salud, en el pre y posoperatorio. El análisis estadístico se realizó mediante la prueba de Shapiro-Wilk y, debido a la distribución no normal, se utilizó la prueba de Wilcoxon para comparar los momentos evaluados. **Resultados:** La muestra estuvo compuesta por 24 pacientes, con predominio masculino y bajo nivel educativo. Se observó alteración en el estado del desempeño funcional [0,00 (0,00–0,75) vs. 1,00 (0,00–1,00); $p<0,001$] y en el puntaje del riesgo de sarcopenia [0,00 (0,00–11,00) vs. 0,00 (2,00–11,00); $p=0,012$]. No se observaron diferencias significativas en las demás variables evaluadas. **Conclusión:** Hubo alteración en el desempeño funcional y en el riesgo de sarcopenia en el período posoperatorio, mientras que las demás variables permanecieron estables, reforzando la importancia de estrategias de rehabilitación en el cuidado de estos pacientes.

Palabras clave: Neoplasias Colorrectales/cirugía; Cirugía Colorrectal; Sarcopenia; Estado Funcional.

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INTRODUCTION

Cancer is one of the main public health challenges in the world and a major cause of global mortality¹. The increase of life expectancy have led to a high incidence of the disease in older individuals, making them more vulnerable and frail. Old age is one of the main challenges in oncologic treatment due to physiological limitations associated with ageing that can directly impact the therapeutic response and recovery of these patients².

781 thousand new cases of cancer are estimated for each year of the triennium 2026-2028 in Brazil, with 518 thousand cases annually, except non-melanoma skin cancer¹. In light of these estimates, colorectal cancer stands out among the most incident cancers in the country, accounting for 10.3% of the cases in men and 10.5% in women, the third among the most prevalent cancers of the Brazilian population³. In the Midwest region, colorectal cancer is one of the most incident with adjusted rates higher than 20 cases per 100 thousand individuals, reinforcing its epidemiologic relevance in the national scenario^{1,2}.

Sarcopenia is among the cancer-related adverse effects characterized by the progressive loss of muscle mass over life. This condition begins around 30 years of age and can be aggravated by chronic diseases like cancer. Muscle loss in oncologic patients is accelerated, ranging between 2% and 15% at each 100 days according to the severity and stage of the disease⁴. For colon cancer, for instance, the deterioration can reach up to 15.6% in one year, equivalent to three decades of regular ageing. The muscular decline is influenced both by disease progression and therapeutic interventions such as surgeries and chemotherapy that frequently intensify this process⁵.

Further to the inherent frailnesses imposed by colorectal cancer (CRC), hospitalization due to acute diseases can accentuate muscle loss even more. It is estimated that between 30% and 60% of inpatients present significant reduction of muscle mass with higher prevalence in critical patients because of metabolic alterations associated with the clinical condition⁶. Major surgical procedures like abdominal surgeries frequently result in post-operative lung complications, increasing the length of hospital stay and hospital costs. In this context, pre-operative physiotherapy plays a key role in the preparation of the patients with specific exercises while post-operative rehabilitation is crucial to minimize the complications and accelerate the recovery⁷.

Oncologic diagnosis, surgical treatment and adverse effects of the therapies can significantly impact the perception patients have of their health. The perception of quality of life among patients with cancer is dynamic because it changes over time as the disease progresses and

after therapeutic interventions. Physical, emotional, social and spiritual aspects influence this perception making it highly subjective and variable in patients with similar clinical conditions⁸.

Due to the limitations imposed by cancer and associated treatments, interventions based on physical exercises have been effective to reduce the negative impacts of the disease, contributing to maintain the functionality and minimize adverse symptoms. Patients survival have increased as a result of oncologic therapies advances, making quality of life a core aspect of the management of the disease⁹.

Studies demonstrate that ageing is closely related to muscle weakness, weight loss, reduction of physical fitness and comorbidities². This study offers a new perspective about these functional and metabolic alterations in patients with CRC, addressing self-rated health and the impacts on the activities of daily living (ADLs) pre and post abdominal surgery. Based on this approach, the association between functional performance and self-rated health in patients with CRC submitted to oncologic surgery was investigated, since these alterations compromise significantly the recovery and quality of life of these patients. The objective is to analyze the effects of CRC surgery over the functional performance and self-rated health of patients with oncologic disease.

METHOD

Quantitative, descriptive and cross-sectional study conducted in the surgical center of “Hospital Ana Nery” located in Santa Cruz do Sul, state of Rio Grande do Sul (RS). Data were collected between October 2024 and April 2025.

The sample was non-probabilistic by convenience consisting in patients diagnosed with CRC who were physically fit to submit to tests and responded to the questionnaire cohesively. Patients were included consecutively while data were being collected according to the patient’s availability and eligibility.

In view of the hospital flow where the study was conducted with approximate mean of ten surgeries per month, the inclusion of the patients was estimated along the collection period. Sample size was based on the feasibility of the enrollment.

The sample was not calculated in advance, however, based on the final number of patients included (n=24) and paired measurement design, the effect size was estimated utilizing the Wilcoxon test¹⁰, resulting in moderate to large magnitude for relevant outcomes. These findings suggest appropriate statistical power to detect clinically significant differences with level of significance of 5%.

All the participants were evaluated pre-operatively in the surgery center and were reevaluated in the oncologic ward post-operation in the routine return visit. The reevaluation visit was not scheduled because it depended on the medical request.

The inclusion criteria were patients of both sexes aged 50 years or older diagnosed with CRC in pre- or post-operative surgical outpatient follow-up. Patients with or without alterations of functional performance, with sarcopenia who agreed to join the study signed the informed consent form (ICF).

Data were collected from patients with CRC in oncologic follow-up and indication for surgery. The initial data were recorded in evaluation files, and the patients have been submitted to functional tests. The clinical characterization of the sample included the identification of self-reported comorbidities. Variables related to CRC staging, neoadjuvant treatments (chemotherapy and radiotherapy) and ostomy were not included in the protocol of data collection of this study.

The ECOG Performance Status (PS-ECOG)¹¹ was utilized to measure the functional performance in grades from 0 (fully active) to 5 (death) and to what extent the disease interferes with the activities of daily living. The risk of sarcopenia was evaluated with the questionnaire SARC-CalF¹² that measures muscle strength, mobility and falls in addition to the circumference of the calf. The final score ranges from 0 (better) to 20 (worst), a score ≥ 11 indicates sarcopenia.

The gait speed test was applied to measure the functional performance of the patient who walks (not runs) 10 meters as fast as possible. The speed is calculated between 2 and 8 meters and values ≤ 0.8 m/s indicate low physical performance¹³. The 1-minute sit-to-stand test was performed with the patient seated in a standard chair and arms crossed over the chest, the number of correct repetitions was counted¹⁴. The self-rated health was measured with the question: "Could you please rate your health status?", the responses ranged from excellent to poor¹⁵.

Next, the patients were post-operatively reevaluated during the routine outpatient visit as long as they did not have surgical complications that hindered the functional tests: the PS-ECOG¹¹, SARC-CalF¹² scales and the handgrip strength (HGS), gait speed, 1-minute sit-to-stand test and self-rated health were reevaluated.

The impact of the CRC surgery over the functional performance and self-rated health was the main outcome through the following variables: PS-ECOG scale, handgrip strength, SARC-CalF score, gait speed, 1-minute sit-to-stand test and subjective self-rated health.

The software IBM SPSS Statistics 20.0¹⁶ was utilized to analyze the data. A non-parametric statistical analysis was

conducted due to the non-normal data distribution earlier verified with the Shapiro-Wilk¹⁷ test with presentation of quantitative variables in median and percentiles one and three and qualitative variables with counts and percent. The non-parametric Wilcoxon test¹⁰ was applied to compare intragroup dependent variables pre and post-surgery.

The Ethics Committee of "Universidade de Passo Fundo (UPF)" approved the study, report number 7126421 (CAAE (submission for ethical review): 82256724.5.0000.5342) in compliance with Directive 466/2012¹⁸ of the National Health Council (CNS).

RESULTS

The sample consisted of 26 patients approached pre-surgery, but two of them were excluded for failing to attend the return outpatient visit for reevaluation. Eventually, the final sample was predominantly formed by 24 male patients, retired, self-reported Whites, most of them did not complete elementary school, submitted to CRC surgery and median age of 68.5 years (Table 1).

More than half of the participants were active smokers according to the associations of smoking and the three measures of dose/duration of smoking and consumed alcohol beverages. A small portion of the participants reported they practiced physical activity, the most frequent were aerobic exercises (Table 1).

There was high frequency of chronic comorbidities, standing out systemic arterial hypertension (SAH) and *diabetes mellitus* (DM) in the patients evaluated. The most common surgical procedure was abdominal rectosigmoidectomy, most of them have been admitted to the intensive care unit (ICU) for post-operative recovery. Few surgical complications have been reported (Table 1).

The analysis of the data focused on the comparison pre- and post-operative moments. The Wilcoxon test¹⁰ was applied, considering the median values of the functional variables analyzed. This approach allowed to identify the maintenance of the functional performance and self-rated health in the period analyzed, respecting the characteristics of the sample and distribution of the data (Table 2).

DISCUSSION

The present study analyzed the impact of CRC surgery on clinical and functional outcomes of patients submitted to oncologic colorectal surgery and reached relevant findings. Mostly, the sample was formed by low-educated males, retired, and mean age between 57.5-76.5 years, similar to the profile observed in the Brazilian study of Souza et al.¹⁹ involving patients with CRC where males



Table 1. Sociodemographic profile of the sample of patients submitted to CRC surgery. Santa Cruz do Sul-RS, 2025

Variables	Representation (n=24)	Variables	Representation (n=24)
Age, years [median (P1 – P3)]	68.50 (57.50 – 76.50)	Physical activity [n (%)]	
Sex [n (%)]		Yes	08 (33.3)
Male	14 (58.3)	No	16 (66.7)
Female	10 (41.7)	Type of physical activity [n (%)]*	
Occupation [n (%)]		Aerobic	08 (100.0)
Retired	16 (66.7)	Comorbidities [n (%)]	
Self-employed	04 (16.8)	No comorbidities	08 (33.3)
Commercial activity	04 (16.8)	Chronic diseases (SAH, DM)	16 (66.7)
Education [n (%)]		Type of surgery [n (%)]	
Incomplete elementary school	17 (70.8)	Partial colectomy/hemicolectomy	06 (25)
Complete elementary school	02 (8.3)	Abdominal rectosigmoidectomy	12 (50)
Incomplete high-school	01 (4.2)	Amputation of the rectum	08 (33.4)
Complete high-school	04 (16.7)	Admission to ICU [n (%)]	
Smoking [n (%)]		No	11 (45.8)
Smoker	13 (54.2)	Yes	13 (54.2)
Non-smoker	02 (8.3)	Days in ICU [median (P1 – P3)]*	2.00 (2.00 – 3.00)
Quit smoking	09 (37.5)	Surgical complications [n (%)]	
Packs/year, years [median (P1 – P3)]*	25.00 (7.50 – 60.00)	No	18 (75.0)
Alcohol consumption [n (%)]		Yes	06 (25.0)
Yes	03 (12.5)	Total days of hospitalization [median (P1 – P3)]	5.00 (4.00 – 6.75)
No	15 (62.5)		
Rarely	06 (25.0)		

Captions: P1: percentile 1/percentile 25%; P3: percentile 3/percentile 75%; n: absolute; %: percent; *: valid values; SAH: systemic arterial hypertension; DM: diabetes mellitus; ICU: intensive care unit.

Table 2. Comparative analysis between pre- and post-surgery of patients with CRC. Santa Cruz do Sul-RS, 2025

Variables	Pre [med. (P1 – P3)]	Post [med. (P1 – P3)]	Z	p ^a
Performance status	0.00 (0.00 – 0.75)	1.00 (0.00 – 1.00)	-3.771	0.000*
Handgrip strength				
Dominant hand	30.00 (23.00 – 46.00)	30.00 (21.75 – 42.75)	-0.412	0.680
General	26.50 (21.00 – 39.50)	28.50 (20.25 – 34.00)	-0.907	0.364
SARC-CalF^a	0.00 (0.00 – 11.00)	0.00 (2.00 – 11.00)	-2.522	0.012*
Gait speed	1.08 (0.87 – 1.37)	1.04 (0.89 – 1.43)	-0.786	0.432
Sit-to-stand test	19.00 (17.00 – 20.75)	18.50 (15.00 – 20.75)	-1.213	0.225
Self-rated health	3.00 (1.00 – 3.00)	2.00 (1.00 – 3.00)	-1.087	0.277

Captions: med.: median; P1: percentile 1/percentile 25%; P3: percentile 3/percentile 75%; a: Wilcoxon test; *: statistical significance ($p < 0.05$); Z: statistical significance of the Wilcoxon test.

predominated (51%, n=24,484), with higher incidence in the 50-74 years old range and lower incidence in younger patients, consistent with the present study.

In addition, there was elevated prevalence of smoking with 54.3% of active smokers in relation to packs/years of 25.00 (7.50 – 60.00) in the referenced study. The study

of Huang et al.²⁰ associated smoking and CRC survival, reporting higher risk of mortality in men who smoked 11 to 20 cigarettes/day ($p=0.0011$) and who smoked for more than 10 years ($p=0.0390$), for men who smoked from 11 to 30 years ($p=0.0076$) and those who smoked for more than 30 years than non-smokers. This study did not calculate

the rate packs/years, but identified that as longer was the smoking period, lower was the CRC survival because smoking is related to chronic inflammatory processes and genetic alterations that favor carcinogenesis. Additionally, it was observed poor adherence to regular practice of physical activity which is an aggravating factor in the oncologic context. Post-operatively, physical inactivity is concerning when the reduction of the functional performance can compromise the rehabilitation, prolong the recovery time and negatively impact the quality of life of the patient; therefore, optimize the perioperative functional performance is a key objective in patients with low survival rates²¹.

Sedentary behavior is a relevant and modifiable component standing out among the factors that negatively impact the CRC survival. Pooled data of three prospective cohort studies show that patients who remain physically inactive after the diagnosis have higher risk of mortality by disease than those physically active²². The risk is particularly high if sedentarism occurs post-diagnosis with increase of up to 61% of risk of death by CRC, while sedentarism prior to the diagnosis also negatively influences but of least magnitude. These data suggest that early intervention to reduce physical inactivity should be prioritized in the protocols of oncologic rehabilitation. Jochem and Leitzmann²² emphasize that regular physical activity can be an effective strategy to improve clinical outcomes and quality of life of these patients.

Post-operative complications are a determinant factor for the clinical outcome of patients submitted to CRC surgery, being frequently associated with the extension of the length of hospital stay. They do not only delay the recovery but also increase hospital costs, the risk of readmissions and mortality, in addition, to double the mean time of hospitalization in relation to patients without complications^{23,24}. Factors like nutritional status, sarcopenia, advanced age, comorbidities and pre-operative low functionality contribute to the risk of complications and prolonged length of hospital stay. Targeted pre-operative interventions such as previous rehabilitation programs, nutritional evaluation and optimization of physical conditioning have been suggested as effective strategies to reduce complications and reduction of the length of hospital stay²¹.

Relatively short length of hospital stay (median five days) associated with a rate of surgical complications of 25% may have contributed to the maintenance of improvement of some functional parameters. Even though, the high rate of ICU admissions shows the complexity of the procedures and vulnerability of this population. These findings reinforce the necessity of specific strategies of rehabilitation for oncologic patients submitted to abdominal surgery, in light of their clinical,

functional and sociodemographic conditions²⁵. The implementation of customized physical exercise programs, evaluation of body mass and continuous functional monitoring can determine the recovery and quality of life of these individuals²⁶.

The findings of the present study indicate that in the period investigated, there were no relevant clinically alterations of the functional performance post colorectal oncologic surgery. Although a few variables have presented statistically significant differences, like the SARC-CalF ($p=0.012$) and the functional performance status ($p=0.000$), the median values are similar between pre-and post-operation, which reinforces the interpretation of the functional stability in the period analyzed.

Similar results are found in the literature. The randomized clinical trial conducted by Bojesen et al.²⁷ compared patients submitted to four weeks of pre-rehabilitation before the elective surgery of CRC with those who received regular care and found that pre-rehabilitation was associated with relevant clinical improvement post-operatively, especially in patients with performance status I and II. Although these findings may appear unexpected in face of the physiologic impact of invasive surgical procedures, the authors highlight that strategies with multiprofessional support, proper pain management and early mobilization play a key role in the preservation of the post-operative functionality.

The study of Li et al.²⁸ compared sarcopenic and non-sarcopenic patients pre- and post-operatively and identified high incidence of severe post-operative complications in the sarcopenic patients ($p=0.014$). These findings corroborate the results of the present study where it was not observed any increased risk of sarcopenia post-operatively as well as low post-operative complications (25%). These evidences reinforce the importance of early rehabilitation and pre-rehabilitation associated with nutritional support pre- and post-operatively as also emphasized by Li et al.²⁸ and Yamamoto et al.²⁹ who demonstrated that pre-rehabilitation is viable even in sarcopenic patients and can contribute to the improvement of the functional performance and surgical recuperation.

According to Meza-Valderrama et al.³⁰, muscle weakness defined by low handgrip strength (<35.5 kg in men or <20 kg in women) and slowness, characterized by usual gait speed lower than 0.8 m/s, are basic criteria for the diagnosis of sarcopenia. However, there were no statistically significant alterations of handgrip strength, gait speed, sit-to-stand test and self-rated health in the present study. These findings suggest that the time for post-operative evaluations may not have been sufficient to find perceptible changes in parameters of muscle strength, global functionality and self-rated health.



Nevertheless, it is important to highlight that sarcopenia is directly associated with worst clinical outcomes in patients submitted to CRC surgery, like more risk of complications, increase of morbimortality and prolonged hospitalization. Early intervention strategies targeted to functional rehabilitation and nutritional support are essential to mitigate the effects of sarcopenia and promote a more effective recovery. Therefore, continuous monitoring of strength and muscle functionality should be incorporated into the routine of post-operative oncologic care aimed at best clinical results and quality of life of the patients.

The sample size was not calculated in advance, which is one of the study limitations, that can limit the detection of small magnitude effects in addition to lack of long-term monitoring that hinders the generalization of the findings. The absence of information on CRC staging, neoadjuvant treatments and presence of ostomy are other limitations worth mentioning, potentially influencing the interpretation of the results related to functional performance and self-rated health, known to be factors directly impacting post-surgery recovery. Future studies with larger samples and evaluations in different moments are recommended to expand the understanding of the functional evolution of patients submitted to CRC surgery.

CONCLUSION

The present study showed the effects of CRC surgery over clinical and functional outcomes of oncologic patients, emphasizing the complexity of this population frequently formed by low-educated individuals and high rates of sedentarism and comorbidities. Patients submitted to colorectal surgery kept the functional performance and self-rated health in the period investigated, possibly influenced by post-operative caring strategies as early mobilization and multiprofessional support. The interpretation of the results must consider the comorbidities and limitations related to the absence of more detailed clinical data.

CONTRIBUTIONS

All the authors contributed substantially to the study conception and design, acquisition, analysis and interpretation of the data, writing and critical review. They approved the final version for publication.

DECLARATION OF CONFLICT OF INTEREST

There is no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

All the content underlying the text is contained in the manuscript.

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