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The Influence of Perioperative Nutrition on the Success of the ERAS® Methodology in Patients Undergoing Elective Colorectal Surgery

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ABSTRACT

The Enhanced Recovery After Surgery (ERAS®) protocol integrates multidisciplinary strategies, including perioperative nutrition, to optimize recovery in elective colorectal surgery. This prospective observational study at Hospital Dr. Nélio Mendonça, in Portugal, evaluated its impact on 23 patients (mean age 66±12.1 years, 65% male), compared to pre-ERAS® care (historical LOS=13 days). Nutritional risk (NRS-2002 ≥3 in 47.8%), BMI (mean 26.2±4.5 kg/m²), postoperative complications, length of hospital stay (LOS), and quality of life (EORTC QLQ-CR29, 1 week to 1 month post-discharge) were assessed. Nearly half (47.8%) were at nutritional risk, associated with longer LOS (p=0.05). Mean LOS was 8±6.5 days (reduced vs. pre-ERAS®), with 39 complications (mainly hemorrhagic, gastrointestinal, metabolic). Quality-of-life scores indicated mild-to-moderate symptoms and satisfactory functional recovery. Perioperative nutrition within ERAS® significantly reduces LOS and complications, underscoring the nutritionist's essential role in multidisciplinary teams and supporting wider protocol implementation in Portuguese hospitals.

Keywords

Colorectal surgery, ERAS®, Nutritional risk, Perioperative nutrition, Quality of life.

Introduction

Colorectal cancer (CRC) is the third most common malignancy worldwide and the most prevalent in Portugal, with approximately 1.9 million and 10 thousand new cases reported in 2022, respectively. According to the latest update from GLOBOCAN, CRC is the second leading cause of cancer-related mortality, both globally and in Portugal. At the national level, it represents the second most common type of cancer in both women and men [1,2]. Although patients with CRC may undergo various treatment modalities, including radiotherapy, chemotherapy, and immunotherapy — either in neoadjuvant or adjuvant settings — the primary therapeutic strategy remains surgical resection of the primary tumor [3]. Over the years, colorectal surgery has evolved with the introduction of new techniques and approaches aimed at preventing or minimizing postoperative complications [3,4]. A significant advancement in the surgical management of CRC was the development of the "fast-track" protocol, which demonstrated that a laparoscopic approach, when combined with the Enhanced Recovery After Surgery (ERAS®) methodology [5], promotes faster patient recovery, reduces length of hospital stay, and decreases postoperative morbidity [6-10]. Since then, the ERAS® methodology has been rapidly adopted by the international medical

community and implemented in several countries, including Portugal.

With advancements in medicine and technology, clinical guidelines have also evolved. The most recent recommendations for elective colorectal surgery were published by Gustafsson et al. [5] under the ERAS® Society. These guidelines include twenty-four elements encompassing measures across different phases of the surgical pathway: preoperative (nutritional support, smoking cessation, alcohol intake control, patient education, carbohydrate loading up to two hours before surgery, among others), intraoperative (minimally invasive surgery, goal-directed fluid therapy, temperature control, among others), and postoperative (early mobilization, early oral intake of fluids and solids, among others) [12,13] (Figure 1).

Mechanical bowel preparation (MBP) is not recommended as a routine practice in elective colon surgery, as it may contribute to increased discomfort and a higher risk of fluid and electrolyte imbalances—factors that are particularly relevant in perioperative nutritional management [13] (Figure 1).

One of the key features of the ERAS® methodology is the emphasis on the preoperative period, which is considered crucial for optimizing surgical outcomes. In addition to standard consultations with surgeons and nurses, patients enrolled in ERAS® programs receive specialized nutritional support, enabling the early identification of individuals at nutritional risk who may benefit from preoperative nutritional interventions, in accordance with the recommendations of the European Society for Clinical Nutrition and Metabolism (ESPEN) [14,15].

Although variations exist between ERAS® protocols, most include measures such as avoiding prolonged fasting, optimizing preoperative nutritional status, providing preoperative carbohydrate loading, avoiding routine bowel preparation, implementing goal-directed hemodynamic therapy, adopting multimodal analgesia with minimal opioid use, promoting early removal of tubes (such as nasogastric tubes, urinary catheters, and drains), and facilitating early recovery of gastrointestinal function [10].

The study of this type of malignancy is of particular importance, given that colorectal cancer remains one of the leading causes of morbidity and mortality in Portugal. The effective implementation of the ERAS® methodology has demonstrated significant clinical benefits, including a lower incidence of postoperative complications and reduced length of hospital stay, as evidenced by Ripollés-Melchor et al. [10].

It is important to note that, at Hospital Dr. Nélio Mendonça, the implementation of the ERAS® methodology is currently in a phase of progressive integration. While some of its components have already been adopted, full implementation of all recommendations has not yet been achieved.

Despite the growing body of evidence, the specific impact of nutritional intervention on the overall success of the ERAS® methodology remains insufficiently clarified. Therefore, the present study aims to analyze the influence of perioperative nutrition on the application of the ERAS® methodology in

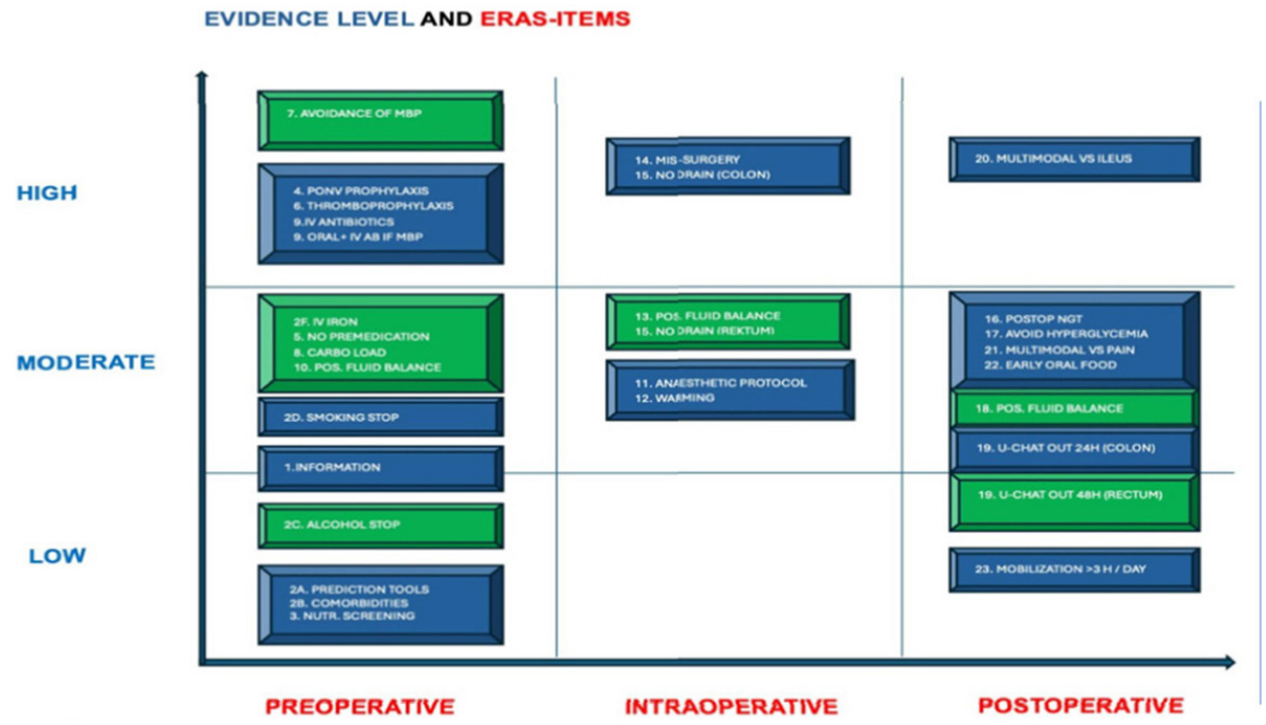

Figure 1: ERAS® Guidelines for Elective Colorectal Surgery: 2025 Update. Note. Adapted from Gustafsson et al. (2025), Guidelines for perioperative care in elective colorectal surgery: Enhanced Recovery After Surgery (ERAS) Society recommendations [16].

patients undergoing elective colorectal surgery, contributing to a better understanding of the role of nutrition in surgical recovery and healthcare efficiency.

Objective

The primary objective of this study was to evaluate the influence of perioperative nutrition on the success of the Enhanced Recovery After Surgery (ERAS®) methodology in patients undergoing elective colorectal surgery.

To achieve this aim, the following specific objectives were defined:

(1) to compare the effectiveness of the ERAS® methodology with the pre-ERAS® standard care model previously implemented in the same hospital, by analyzing the impact of nutritional and clinical factors on length of hospital stay, postoperative complications, and surgical recovery;
(2) to assess preoperative nutritional risk using indicators such as body mass index (BMI) and a validated nutritional risk screening tool; and
(3) to evaluate the impact of perioperative nutrition on post-discharge quality of life.

Materials and Methods

This was a prospective, longitudinal, observational study conducted in the General Surgery Department of Hospital Dr. Nélio Mendonça.

All patients undergoing colorectal surgery at Hospital Dr. Nélio Mendonça between December 2, 2024, and February 28, 2025, were included. Inclusion criteria comprised adult individuals (≥18 years) undergoing colorectal surgery under the ERAS® methodology, who were conscious and able to respond to the questionnaire. Exclusion criteria included patients who had previously undergone surgery within the same ERAS® protocol, either at the same or another institution, as well as those who declined participation or did not receive preoperative follow-up.
The study was approved by the Ethics Committee of Hospital Dr. Nélio Mendonça. All participants provided written informed consent. Data were collected from medical records and handled confidentially.

Nutritional risk was assessed using the Nutritional Risk Screening 2002 (NRS-2002), which was applied during the nutrition consultation and repeated upon hospital admission. All forms were coded to ensure anonymity. Results were categorized into two groups: no risk (score <3) and at nutritional risk (score ≥3).

Anthropometric assessment of weight and height followed the procedures described in the Nutrition Department's Manual of Procedures. Body weight was measured both during the consultation and at hospital admission using a calibrated scale. Measurements were performed with the patient barefoot, wearing light clothing and no accessories, ensuring an upright and stable position with feet parallel on the platform. Weight was recorded to the nearest 0.1 kg.

Height was obtained from medical records or, when necessary, measured directly using a stadiometer. During measurement, the patient stood upright, facing forward, with the head positioned in the Frankfort plane. The head, back, buttocks, and legs (whenever possible) were aligned with the stadiometer. Heels were kept together and feet positioned at approximately a 60° angle. Height was recorded to the nearest 0.1 cm. Measurements were taken with the patient barefoot and without accessories, and patients were instructed to inhale and maintain an erect posture.

Body mass index (BMI) was calculated using the formula weight/height² (kg/m²). Classification followed the World Health Organization (WHO) criteria (WHO, 1995; 2000) for adults and the Lipschitz (1994) classification for individuals aged ≥65 years.

Collected data were recorded in Microsoft Excel and subsequently analyzed using SPSS Statistics (version 29 for Windows).

Statistical Analysis

Given that the sample size was fewer than 30 participants, normality of the dependent variable (length of hospital stay) was assessed using the Shapiro–Wilk test. The obtained p-value was below 0.05 ($p<0.001$), indicating that the data did not follow a normal distribution.

Therefore, the non-parametric Wilcoxon test was used, as it does not require assumptions regarding data distribution and is more suitable for small sample sizes and non-normally distributed variables. Although it has lower statistical power compared to parametric tests, it is more robust and flexible for the analysis of non-normal or ordinal data.

Results and Discussion

A total of 23 patients undergoing elective colorectal surgery under the ERAS® methodology were evaluated. The demographic characteristics are presented in Table 1.

The mean age was 66 ± 12.1 years, with a median of 65 years, ranging from 46 to 89 years. A predominance of male patients was observed (65.2%, n=15), compared to females (34.8%, n=8).

Table 1: Demographic characteristics of the study sample.

	Value
Age (years)	66 (46-89)
< 65 (n %)	10 (43.5)
≥ 65 (n %)	13 (56.5)
Sex	**n (%)**
Male	15 (65.2)
Female	8 (34.8)

All 23 patients were evaluated in preoperative consultations in Anesthesiology, Nursing, and Nutrition (Table 2).

Regarding nutritional status assessment, among patients aged <65 years, 3 (13.0%) had normal weight, 4 (17.4%) were classified as overweight, and 3 (13.0%) as class I obesity. In individuals aged

≥65 years, 3 (13.0%) were underweight, 6 (26.1%) were classified as eutrophic, and 4 (17.4%) as overweight.

Nutritional risk screening identified 11 patients (47.8%) with NRS-2002 ≥3, classified as being at nutritional risk, while 12 (52.2%) were considered not at risk. The most prevalent comorbidities were cardiovascular disease (n=14, 60.9%) and diabetes mellitus (n=8, 34.8%).

Table 2: Preoperative clinical characteristics of the study population.

		n (%)
Consultations		
Anesthesiology		23 (100)
Nursing		23 (100)
Nutrition		23 (100)
BMI		
< 65 years	Normal weight	3 (13)
	Overweight	4 (17.5)
	Class I obesity	3 (13)
≥ 65 years	Underweight	3 (13)
	Normal weight	6 (26.1)
	Overweight	4 (17.4)
NRS-2002		
< 3		12 (52.2)
≥ 3		11 (47.8)
Comorbidities		
Cardiovascular disease		14 (60.9)
Diabetes mellitus		8 (34.8)
Respiratory disease		1 (4.4)
Alcohol consumption		
Current consumption		5 (21.7)
No consumption		17 (73.9)
Former consumption		1 (4.3)
Smoking status		
Current smoker		3 (13.05)
Non-smoker		17 (73.9)
Former smoker		3 (13.05)
Tumor location		
Small intestine		3 (13)
Cecum		1 (4.3)
Colon (unspecified)		2 (8.7)
Ascending colon		3 (13)
Transverse colon		4 (17.4)
Sigmoid colon		5 (21.8)
Rectum		5 (21.8)
Surgical procedure		
Abdominoperineal resection		2 (8.7)
Ileocecal resection		1 (4.3)
Segmental enterectomy		2 (8.7)
Right hemicolectomy		9 (39.1)
Low anterior resection		3 (13)
Sigmoidectomy		6 (26.1)
Surgical approach		
Laparoscopic		23 (100)

Regarding lifestyle habits, 5 patients (21.7%) reported alcohol consumption, while 17 (73.9%) did not consume alcohol. In terms of smoking status, 3 patients (13.0%) were current smokers, 3 (13.0%) were former smokers, and 17 (73.9%) were non-smokers.

Tumor location analysis showed a higher prevalence in the sigmoid colon and rectum (5 patients each, 21.7%), followed by the transverse colon (n=4, 17.4%), and the ascending colon and small intestine (n=3, 13.0%). The most frequent surgical procedures were right hemicolectomy (n=9, 39.1%), sigmoidectomy (n=6, 26.1%), and low anterior resection (n=3, 13.0%). All patients underwent a laparoscopic approach.

Regarding neoadjuvant therapies, only two patients underwent total neoadjuvant therapy (TNT), and one patient received neoadjuvant therapy (NT).

During the preoperative nutrition consultation, all patients received individualized dietary counseling and were advised to include a protein component in their meals, as well as to follow a low-residue diet in the three days preceding surgery (n=23, 100%). Clarification of doubts and correction of dietary errors were recorded in 21 cases (91.3%).

Regarding meal organization, only one patient (4.3%) was advised to avoid prolonged fasting periods, and one patient (4.3%) was instructed to adopt meal fractionation throughout the day; these recommendations were not commonly implemented across the cohort.

In terms of dietary composition, 17 patients (73.9%) were encouraged to increase the intake of high-quality protein foods, such as eggs. Reduction in the consumption of processed meats, ready-made meals, and added sugars was recorded in only one patient (4.3%).

With respect to oral nutritional supplementation, hyperproteic and/or hypercaloric supplements were prescribed in 3cases (13.0%). Guidance to ensure adequate fluid intake was provided to 10 patients (43.5%).

Overall, preoperative nutritional intervention was mainly focused on protein adequacy and reduction of dietary residue, whereas oral nutritional supplementation and the promotion of adequate hydration were less frequently implemented (Table 3).

Nutritional intervention was integrated across all phases of the perioperative period.

In the preoperative phase, patients were advised to follow a low-residue diet and received carbohydrate-rich beverages immediately prior to surgery, a key measure to reduce prolonged fasting and optimize the metabolic response.

In the postoperative phase, a stepwise dietary progression was implemented, beginning with the early introduction of clear liquids in combination with modular supplements, followed by a low-

residue liquid diet, then a soft diet, and subsequently a low-residue solid diet. Whenever necessary, protein supplementation was provided to ensure adequate intake and support clinical recovery.

At hospital discharge, patients received individualized nutritional guidance whenever indicated, including the continuation of oral nutritional supplements and referral to outpatient nutrition consultation, particularly in cases of nutritional risk, malnutrition, or presence of ileostomy, ensuring appropriate monitoring and follow-up after surgery.

Table 3: Nutritional management during the preoperative consultation in elective colorectal surgery.

Nutrition education and adherence	n (%)
Individualized dietary counseling	
Yes	23 (100)
No	0 (0)
Clarification of doubts and correction of dietary errors	
Yes	21 (91.3)
No	2 (8.7)
Meal organization	
Avoid prolonged fasting periods	
Yes	1 (4.3)
No	22 (95.7)
Meal fractionation throughout the day	
Yes	1 (4.3)
No	22 (95.7)
Compliance with preoperative fasting (6 h for solids, 2 h for clear liquids)	
Yes	23 (100)
No	0 (0)
Diet composition	
Ensure protein intake	
Yes	23 (100)
No	0 (0)
Low-residue diet in the 3 days prior to surgery	
Yes	23 (100)
No	0 (0)
Increase intake of high-quality protein foods (e.g., eggs)	
Yes	17 (73.9)
No	6 (26.1)
Reduce consumption of processed meats, ready-made meals, and added sugars	
Yes	1 (4.3)
No	22 (95.7)
Oral nutritional supplementation	
Initiation of hyperproteic and/or hypercaloric oral supplements	
Yes	3 (13)
No	20 (87)
Hydration	
Ensure adequate fluid intake	
Yes	10 (43.5)
No	13 (56.5)

The nutritional intervention pathway is summarized in the following schematic (Figure 2).

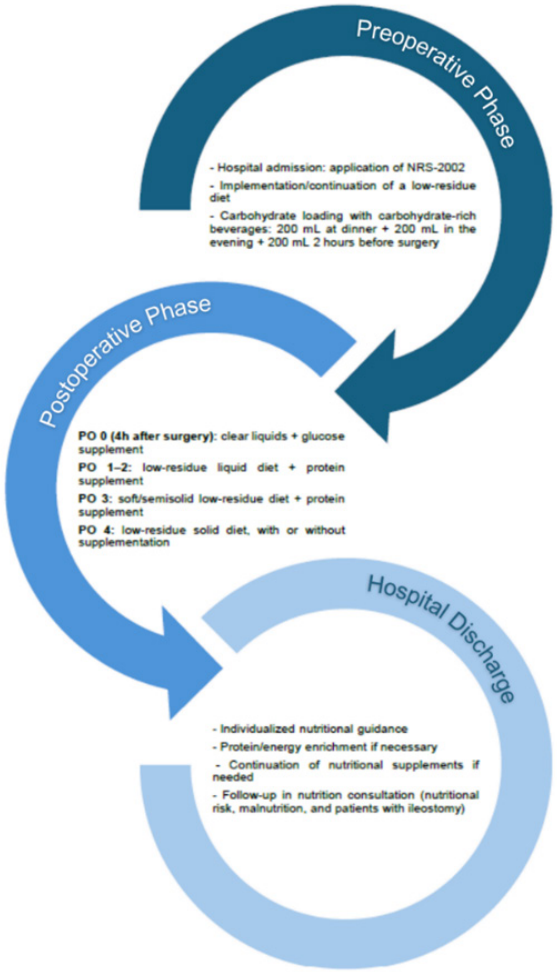

Figure 2: Perioperative nutritional intervention pathway.
Source: Own elaboration (Rodrigues AFBG, 2025)

Statistical analysis demonstrated that nutritional risk, assessed using the NRS-2002, was significantly associated with length of hospital stay. Patients classified as not at risk (NRS <3) had shorter hospital stays ($Z = -0.019$; $p = 0.003$), whereas those classified as at nutritional risk (NRS ≥3) experienced longer hospitalizations ($Z = -2.384$; $p = 0.017$).

The presence of comorbidities was also associated with prolonged hospital stay, particularly cardiovascular disease ($Z = -3.891$; $p < 0.001$), diabetes mellitus ($Z = -3.327$; $p < 0.001$), and respiratory disease ($Z = -2.969$; $p = 0.003$).

Regarding nutritional intervention, several measures showed a significant association with reduced length of hospital stay (Table 4). These included individualized dietary counseling ($Z = -4.171$; $p < 0.001$), clarification of doubts and correction of dietary errors ($Z = -4.085$; $p < 0.001$), adherence to recommended preoperative fasting ($Z = -4.171$; $p < 0.001$), implementation of a low-residue diet in the three days prior to surgery ($Z = -4.171$; $p < 0.001$), and ensuring adequate protein intake ($Z = -2.848$; $p = 0.004$).

Other interventions, including reduction in the consumption of processed meats, ready-made meals, and added sugars (Z = -2.969; p = 0.003), increased intake of high-quality protein foods (Z = -3.875; p < 0.001), prescription of hyperproteic and/or hypercaloric oral nutritional supplements (Z = -3.573; p < 0.001), and promotion of adequate fluid intake (Z = -3.573; p < 0.001), were also associated with significantly shorter hospital stays.

Table 4: Relationship between nutritional risk, comorbidities, nutritional intervention, and length of hospital stay.

	Z	p-value
	Length of hospital stay (days)	
NRS-2002		
Score < 3: no nutritional risk	-3.019	**0.003**
Score ≥ 3: nutritional risk	-2.384	**0.017**
Comorbidities		
Cardiovascular disease	-3.891	**<0.001**
Diabetes mellitus	-3.327	**<0.001**
Respiratory disease	-2.969	**0.003**
Nutritional intervention		
Individualized dietary counseling	-4.171	**<0.001**
Clarification of doubts and correction of dietary errors	-4.085	**<0.001**
Avoid prolonged fasting periods	-2.969	**0.003**
Meal fractionation throughout the day	-2,969	**0.003**
Compliance with preoperative fasting (6 h solids, 2 h clear liquids)	-4.171	**<0,001**
Ensure adequate protein intake	-2.848	**0.004**
Low-residue diet in the 3 days prior to surgery	-4.171	**<0.001**
Reduce consumption of processed meats, ready-made meals, and added sugars	-2.969	**0.003**
Increase intake of high-quality protein foods (e.g., eggs)	-3.875	**<0.001**
Hyperproteic and/or hypercaloric oral nutritional supplementation	-3.573	**<0.001**
Ensure adequate fluid intake	-3.573	**<0.001**

BMI analysis (Table 5) did not reveal statistically significant differences in length of hospital stay among patients aged <65 years (p > 0.05).

In contrast, among patients aged ≥65 years, significant associations were observed between BMI and length of hospital stay (Z = -3.193; p = 0.001).

In this age group, normal weight was associated with a significantly shorter hospital stay (Z = -2.226; p = 0.024), whereas higher BMI values, particularly overweight, showed a tendency toward longer hospitalizations (Z = -1.857; p = 0.063).

The analysis of postoperative complications allowed the identification of different types of adverse events with a direct impact on length of hospital stay (Table 6). A total of 39 complications were recorded among 23 patients, corresponding to a mean of 1.7 ± 1.9 complications per patient, ranging from zero to seven.

Table 5: Relationship between body mass index and length of hospital stay.

		BMI (consultation)		BMI (hospital admission)	
BMI classification		Z	ρ-value	Z	ρ-value
< 65 anos	Normal weight	-0.816	0.414	-0.535	0593
	overweight	0.000	1.000	-0.705	0.705
	Class I obesity	-1.414	0.157	-1.342	0.180
Overall BMI (<65 years)		-0.214	0.831	-0.600	0.549
≥ 65 anos	Underweight	-1.604	0.109	-1.633	0.102
	Normal weight	-2.264	**0.024**	-2.264	**0.024**
	Overweight	-1.841	0.066	-1.857	0.063
Overall BMI (≥65 years)		-3.193	**0.001**	-3.193	**0.001**

The most frequent complications were hemorrhagic, accounting for 23.1% (n=9), followed by gastrointestinal (17.9%; n=7), metabolic (17.9%; n=7), and respiratory complications (12.8%; n=5). Less frequent were infectious (10.2%; n=4), urinary (5.1%; n=2), and cardiovascular complications (2.6%; n=1). Additional complications classified as "other" (10.3%; n=4) were also reported, including the need for reoperation. No thromboembolic complications were observed.

Within the gastrointestinal complications, persistent nausea and vomiting, postoperative diarrhea, and food intolerance with delayed dietary progression were reported. Infectious complications mainly consisted of surgical site infections, along with cases of fever and sepsis. Among respiratory complications, atelectasis was the most notable finding. Urinary complications were associated with urinary retention requiring catheterization. Cardiovascular complications corresponded to postoperative hypertension. Hemorrhagic complications included episodes of lower gastrointestinal bleeding and surgical wound bleeding. Metabolic complications comprised cases of hyperglycemia and electrolyte imbalances. Among complications classified as "other," reoperation and the development of pressure ulcers were the most prominent.

Overall, a statistically significant association was observed between the number of complications and length of hospital stay (Z = -3.714; p < 0.001), confirming that patients with a higher number of complications experienced longer hospitalizations.

Table 7 presents the comparison of key clinical and nutritional indicators between the period prior to the implementation of the ERAS® methodology and the current period corresponding to the present study. Both samples showed similar mean ages (≈66 years) and a comparable sex distribution, with a slight predominance of males in both periods, supporting the comparability between the analyzed groups.

In the pre-ERAS® context, most nutritional and functional measures were not yet systematically implemented, particularly

Table 6: Relationship between postoperative complications and length of hospital stay.

	Type of complications									Tot Comp.	DI	Z	ρ-value
	GI	INF	RESP	URI	CV	HEM	TEV	MET	OUT				
1N	0	0	0	0	0	0	0	0	0	0	6	-3.714	<0.001
2N	0	0	0	0	0	0	0	0	0	0	6		
3N	0	0	0	0	0	0	0	0	0	0	5		
4N	0	0	1	0	0	0	0	1	0	2	5		
5N	1	0	0	0	0	1	0	0	0	2	8		
6N	0	0	0	0	0	0	0	0	0	0	5		
7N	0	0	0	0	0	0	0	1	0	1	2		
8N	0	1	0	1	0	0	0	1	0	3	22		
9N	1	0	0	0	0	0	0	0	0	1	5		
10N	0	0	0	0	0	1	0	0	0	1	5		
11N	0	0	0	0	0	0	0	0	0	0	6		
12N	0	0	0	0	0	1	0	1	0	2	5		
13N	3	0	1	0	1	0	0	1	1	7	7		
14N	0	0	0	0	0	1	0	0	0	1	7		
15N	0	0	0	0	0	0	0	0	0	0	5		
16N	0	0	1	0	0	1	0	1	0	3	8		
17N	1	2	1	0	0	0	0	0	2	6	32		
18N	0	0	1	0	0	1	0	1	0	3	5		
19N	1	0	0	0	0	1	0	0	0	2	5		
20N	0	0	0	0	0	0	0	0	0	0	6		
21N	0	0	0	0	0	1	0	0	0	1	5		
22N	0	1	0	1	0	0	0	0	1	3	9		
23N	0	0	0	0	0	1	0	0	0	1	5		
Abs. Freq. (n)	7	4	5	2	1	9	0	7	4	39	174		
Rel. Freq. (%)	17.9	10.2	12.8	5.1	2.6	23.1	0.0	17.9	10.3	100	100		

Legend: 1N–23N – anonymized participant identification; CV – cardiovascular; LOS – length of hospital stay; Freq. n (%) – absolute and relative frequency; GI – gastrointestinal; HEM – hemorrhagic; INF – infectious; MET – metabolic; OTH – other; RESP – respiratory; TEV – thromboembolic; Tot Comp – total complications; URI – urinary.

structured nutritional assessment, preoperative consultation, intake of carbohydrate-rich beverages prior to surgery, and early initiation of oral intake after the procedure.

In the ERAS® period, a more consistent application of these recommendations was observed, with particular emphasis on the effective integration of the nutritionist into the multidisciplinary team and the implementation of nutritional and metabolic optimization strategies across all perioperative phases.

Overall, a marked reduction in the mean length of hospital stay was observed between the two periods (13 days in the pre-ERAS® period versus 8 days in the ERAS® period).

It is important to note that the current mean was influenced by two outlier cases of prolonged hospital stay (22 and 32 days), related to postoperative complications. The median length of stay was approximately 6 days, more accurately reflecting the overall trend toward reduced hospitalization duration.

Regarding postoperative complications, differences were identified between the two periods, with greater detail and diversity of events recorded in the present study, particularly in the gastrointestinal domain. However, cardiovascular, urinary, and infectious complications showed lower values compared to the retrospective study.

These findings indicate an overall improvement in perioperative care and highlight a greater integration of clinical nutrition into the healthcare process, reflecting the positive impact of the ERAS® methodology in the hospital setting.

Quality of life assessment, performed using the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire for Colorectal Cancer (EORTC QLQ-CR29), allowed the identification of changes across different functional

and symptomatic domains (Tables 7-11).

Table 7: Comparison of key clinical and nutritional indicators before and after ERAS® implementation.

		Pre-ERAS® group	ERAS® group
Sample size (n)		93	23
Mean age ± DP (years)		66 ± 11	66 ± 12.1
Sex	Female (%)	47	34.8
	Male (%)	53	65.2
Nutritional risk assessment (NRS-2002)		28% screened	100% screened
Preoperative nutrition consultation		Not performed	100% of patients assessed
Oral nutritional supplementation (SNO)		0%	13%
Preoperative carbohydrate-rich beverage intake		2%	100%
Mean fasting time (solids)		11h	≤ 6h
Postoperative oral intake initiation		Day 6	Day 1 (liquids)
Mean length of hospital stay (days)		13	8
Complications	Gastrointestinal (%)	12.9	17.9
	Infectious (%)	12.9	10.2
	Respiratory (%)	8.6	12.8
	Urinary (%)	12.9	5.1
	Cardiovascular (%)	9.7	2.6
	Other (%)	-	51.3
Quality of life assessment		-	EORTC QLQ-CR29

Legend: Comparative data between the retrospective study *"Time to Start a New ERAS"* (Rodrigues et al., 2024) and the present prospective study, both conducted in the General Surgery Department of Hospital Dr. Nélio Mendonça (SESARAM).

Regarding urinary function, daytime urinary frequency showed a mean of 2.8 ± 0.9 in males and 2.2 ± 0.7 in females, while nocturnal frequency was similar between sexes (2.3 ± 1.2 and 2.2 ± 0.9, respectively). Pain during urination was more frequently reported in males (2.0 ± 1.1) compared to females (1.1 ± 0.3), and urinary incontinence was not reported (1.0 ± 0.0).

In terms of gastrointestinal symptoms, abdominal pain was notable, with a mean of 2.4 ± 1.1 in males and 2.1 ± 0.6 in females. Abdominal bloating was mild in both sexes (2.0 ± 0.8 and 2.2 ± 0.9, respectively). The presence of blood in stools (1.3 ± 0.8 and 1.5 ± 1.1) and mucus in stools (1.4 ± 1.0 and 1.3 ± 0.5) was infrequent. Dry mouth showed an overall mean of 2.1 ± 1.0, indicating a mild symptom burden.

Regarding body image, slightly higher mean scores were observed in females for the items "feeling less attractive" (1.4 ± 1.1) and "dissatisfaction with body image" (1.4 ± 1.1), compared to males (1.1 ± 0.5 and 1.3 ± 0.7, respectively). The item "feeling less masculine/feminine" had a mean of 1.2 ± 0.8 in males and 1.0 ± 0.0 in females.

In the domain of sexual function, low interest in sexual activity was observed in males (2.0 ± 1.2), along with some difficulty in achieving or maintaining an erection (2.1 ± 1.4). In females, low sexual interest was also observed (1.2 ± 0.5), with no reported pain during sexual intercourse (1.0 ± 0.0).

Regarding general concerns, concern about future health was moderate in females (3.0 ± 0.5) and mild in males (2.2 ± 0.9). Concern about body weight was more pronounced in females (2.1 ± 1.1) compared to males (1.3 ± 0.6).

Taste alterations were not reported (1.0 ± 0.0), and hair loss was considered "not applicable" in most participants (4.5 ± 1.4).

Overall, mean scores indicated symptoms of mild to moderate intensity, varying according to domain and sex, as summarized in Tables 8–12.

Among patients with a stoma (n=5), complaints of involuntary gas release were reported (2.6 ± 1.1), as well as occasional fecal leakage (1.2 ± 0.4), whereas peristomal skin irritation was not reported (1.0 ± 0.0). The need to change the stoma bag during the day was occasional (2.0 ± 0.0), while most patients did not report this need at night (1.8 ± 0.4). Both embarrassment related to the stoma and difficulties in managing the stoma bag were mild (1.2 ± 0.4), suggesting overall good adaptation

Among patients without a stoma, involuntary gas release via the anus showed similar mean values in males (1.2 ± 0.6) and females (1.2 ± 0.7). Fecal leakage was mild (1.2 ± 0.4 and 1.4 ± 1.1, respectively), and anal irritation was minimal (1.0 ± 0.0 and 1.1 ± 0.4). Increased bowel frequency was mild during the day (1.4 ± 0.6 and 2.2 ± 1.2) and at night (1.3 ± 0.4 and 2.4 ± 0.9), with a tendency toward higher frequency in females.

The present study aimed to evaluate the influence of perioperative nutrition on the success of the Enhanced Recovery After Surgery (ERAS®) methodology in patients undergoing elective colorectal surgery. Through the analysis of the collected data, it was possible to characterize the study sample, assess preoperative nutritional risk, describe the occurrence of complications, and evaluate the impact of nutritional intervention on clinical recovery and quality of life. The findings are discussed in light of current evidence, with particular emphasis on the relevance of clinical nutrition and the integration of the nutritionist as a key component of the multidisciplinary team.

The demographic characterization revealed that most patients were male (65.2%), with a mean age of 66 years. These findings are consistent with the epidemiology of colorectal cancer, which shows a slightly higher incidence in males and increases significantly after the age of 50, reaching higher prevalence among individuals aged ≥65 years [14]. Similarly, recent surgical studies report comparable mean ages, typically ranging between 65 and 70 years [17].

Table 8: Quality of life outcomes in patients undergoing colorectal surgery.

	Male		Female	
	n (%)	Mean ± DP	n (%)	Mean ± DP
Daytime urinary frequency	15 (100)	2.8 ± 0.9	8 (100)	2.2 ± 0.7
None	1 (6.7)		1 (12.5)	
A little	4 (26.7)		4 (50)	
Moderately	7 (46.7)		3 (37.5)	
Very much	3 (20.0)		0 (0)	
Night-time urinary frequency	15 (100)	2.3 ± 1.2	8 (100)	2.2 ± 0.9
None	5 (33.3)		1 (12.5)	
A little	4 (26.7)		5 (62.5)	
Moderately	3 (20.0)		1 (12.5)	
Very much	3 (20.0)		1 (12.5)	
Urinary incontinence	15 (100)	1.0 ±0.0	8 (100)	1.0 ± 0.0
None	15 (100)		8 (100)	
A little	0 (0)		0 (0)	
Moderately	0 (0)		0 (0)	
Very much	0 (0)		0 (0)	
Pain during urination	15 (100)	2.0 ±1.1	8 (100)	1.1 ± 0.3
None	6 (40)		7 (87.5)	
A little	6 (40)		1 (12.5)	
Moderately	0 (0)		0 (0)	
Very much	3 (20)		0 (0)	
Abdominal pain	15 (100)	2.4 ± 1.1	8 (100)	2.1 ± 0.6
None	4 (26.7)		1 (12.5)	
A little	4 (26.7)		5 (62.5)	
Moderately	4 (26.7)		2 (25)	
Very much	3 (20)		0 (0)	
Anal/rectal pain	15 (100)	1.1 ±0.3	8 (100)	1.1 ± 0.3
None	14 (93.3)		7 (87.5)	
A little	1 (6.7)		1 (12.5)	
Moderately	0 (0)		0 (0)	
Very much	0 (0)		0 (0)	
Abdominal bloating	15 (100)	2.0 ±0.8	8 (100)	2.2 ± 0.9
None	5 (33.3)		1 (12.5)	
A little	5 (33.3)		5 (62.5)	
Moderately	5 (33.3)		1 (12.5)	
Very much	0 (0)		1 (12.5)	
Blood in stools	15 (100)	1.3 ± 0.8	8 (100)	1.5 ± 1.1
None	12 (80)		6 (75)	
A little	2 (13.3)		1 (12.5)	
Moderately	0 (0)		0 (0)	
Very much	1 (6.7)		1 (12.5)	
Mucus in stools	15 (100)	1.1 ± 0.5	8 (100)	1.1 ± 0.3
None	14 (93.3)		7 (87.5)	
A little	0 (0)		1 (12.5)	
Moderately	1 (6.7)		0 (0)	
Very much	0 (0)		0 (0)	
Dry mouth	15 (100)	1.5 ±0.7	8 (100)	2.1 ± 1.0
None	10 (66.7)		2 (25)	
A little	3 (20)		4 (50)	
Moderately	2 (13.3)		1 (12.5)	
Very much	0 (0)		1 (12.5)	
Hair loss (treatment-related)	15 (100)	4.5 ± 1.2	8 (100)	4.5 ± 1.4
None	1 (6.7)		1 (12.5)	
A little	0 (0)		0 (0)	
Moderately	0 (0)		0 (0)	
Very much	13 (86.7)		7 (87.5)	
Taste changes	15 (100)	10 ± 0.0	8 (100)	1.0 ± 0.0
None	15 (100)		8 (100)	
A little	0 (0)		0 (0)	
Moderately	0 (0)		0 (0)	
Very much	0 (0)		0 (0)	
Concern about future health	15 (100)	2.2 ± 0.9	8 (100)	30 ± 0.5
None	4 (26.7)		1 (12,5)	
A little	5 (33.3)		0 (0)	
Moderately	5 (33.3)		6 (75)	
Very much	1 (6.7)		1 (12.5)	

Concern about body weight	15 (100)	1.3 ± 0.6	8 (100)	2.1 ± 1.1
No None A little Moderately Very much	12 (80) 2 (13.3) 1 (6.7) 0 (0)		3 (37.5) 2 (25) 2 (25) 1 (12.5)	
Feeling physically less attractive	15 (100)	1.1 ± 0.5	8 (100)	1.4 ± 1.1
None A little Moderately Very much	14 (93.3) 0 (0) 1 (6.7) 0 (0)		7 (87.5) 0 (0) 0 (0) 1 (12.5)	
Feeling less masculine/feminine	15 (100)	1.2 ± 0.6	8 (100)	1.0 ± 0.0
None A little Moderately Very much	13 (86.7) 1 (6.7) 1 (6.7) 0 (0)		8 (100) 0 (0) 0 (0) 0 (0)	
Dissatisfaction with body image	15 (100)	13 ± 0.7	8 (100)	1.4 ± 1.1
None A little Moderately Very much	12 (80) 1 (6.7) 2 (13.3) 0 (0)		7 (87.5) 0 (0) 0 (0) 1 (12.5)	
Presence of stoma	15 (100)	1.7 ±0.5	8 (100)	2.0 ± 0.0
Yes No	5 (33.3) 10 (66.7)		0 (0) 8 (100)	

Table 9: Quality of life assessment in patients undergoing colorectal surgery – patients with a stoma.

		Male		Female	
		n (%)	**Mean ± DP**	**n (%)**	**Mean ± DP**
With stoma	**Involuntary gas release from stoma**	5 (100)	2.6 ± 1.1		
	None A little Moderately Very much	1 (20) 1 (20) 2 (40) 1 (20)			
	Fecal leakage from stoma	5 (100)	1.2 ± 0.4		
	None A little Moderately Very much	4 (80) 1 (20) 0 (0) 0 (0)			
	Peristomal skin irritation	5 (100)	1.0 ± 0.0		
	None A little Moderately Very much	5 (100) 0 (0) 0 (0) 0 (0)			
	Need to change stoma bag during the day	5 (100)	2.0 ± 0.0		
	None A little Moderately Very much	0 (0) 5 (100) 0 (0) 0 (0)			
	Need to change stoma bag during the night	5 (100)	1.8 ± 0.4		
	None A little Moderately Very much	1 (20) 4 (80) 0 (0) 0 (0)			
	Embarrassment due to stoma	5 (100)	1.2 ± 0.4		
	None A little Moderately Very much	4 (80) 1 (20) 0 (0) 0 (0)			
	Difficulties managing the stoma	5 (100)	1.2 ± 0.4		
	None A little Moderately Very much	4 (80) 1 (20) 0 (0) 0 (0)			

Table 10: Quality of life assessment in patients undergoing colorectal surgery –without stoma.

		Male		Female	
		n (%)	Mean ± DP	n (%)	Mean ± DP
Without stoma	**Involuntary gas release via the anus**	10 (100)	1.2 ± 0.6	8 (100)	1.2 ± 0.7
	None A little Moderately Very much	9 (90) 0 (0) 1 (10) 0 (0)		7 (87.5) 0 (0) 1 (12.5) 0 (0)	
	Fecal leakage via the anus	10 (100)	1.2 ± 0.4	8 (100)	1.4 ± 1.1
	None A little Moderately Very much	8 (80) 2 (20) 0 (0) 0 (0)		7 (87.5) 0 (0) 0 (0) 1 (12.5)	
	Anal skin irritation	10 (100)	1.0 ± 0.0	8 (100)	1.1 ± 0.4
	None A little Moderately Very much	10 (100) 0 (0) 0 (0) 0 (0)		7 (87.5) 1 (12.5) 0 (0) 0 (0)	
	Frequent bowel movements (daytime)	10 (100)	1.4 ± 0.6	8 (100)	2.2 ± 1.2
	None A little Moderately Very much	7 (70) 2 (20) 1 (10) 0 (0)		3 (37.5) 1 (12.5) 3 (37.5) 1 (12.5)	
	Frequent bowel movements (night-time)	10 (100)	1.3 ± 0.4	8 (100)	2.4 ± 0.9
	None A little Moderately Very much	7 (70) 3 (30) 0 (0) 0 (0)		1 (12.5) 4 (50) 2 (25) 1 (12.5)	
	Embarrassment due to bowel function	10 (100)	1.0 ± 0.0	8 (100)	1.0 ± 0.0
	None A little Moderately Very much	10 (100) 0 (0) 0 (0) 0 (0)		8 (100) 0 (0) 0 (0) 0 (0)	

Table 11: Sexual function assessment in male patients undergoing colorectal surgery.

	Male	
	n (%)	Mean ± DP
Interest in sexual activity	15 (100)	2.0 ± 1.2
None A little Moderately Very much	8 (53.3) 1 (6.7) 4 (26.7) 2 (26.7)	
Difficulty achieving or maintaining an erection	15 (100)	2.1 ± 1.4
None A little Moderately Very much	8 (53.3) 1 (6.7) 2 (13.3) 4 (26.7	

Table 12: Sexual function assessment in female patients undergoing colorectal surgery.

	Female	
	n (%)	Mean ± DP
Interest in sexual activity	8 (100)	1.2 ± 0.5
None A little Moderately Very much	6 (75) 2 (25) 0 (0) 0 (0)	
Pain or discomfort during sexual intercourse	8 (100)	1.0 ± 0.0
None A little Moderately Very much	8 (100) 0 (0) 0 (0) 0 (0)	

Regarding nutritional risk assessment, a higher prevalence of overweight was observed among individuals aged <65 years, whereas eutrophy predominated in older patients. This trend is consistent with European data showing a progressive increase in overweight up to approximately 70 years of age, followed by a decline in older age groups [18]. These findings suggest that the observed pattern reflects the typical age-related distribution of body composition. In surgical settings, European studies also report a high prevalence of overweight prior to surgery, sometimes exceeding 70% of cases [17].

In older adults, body composition undergoes significant physiological changes, characterized by a progressive reduction in fat-free mass and a relative increase in fat mass, even when total body weight remains stable. This loss of muscle mass, known as sarcopenia, compromises strength, mobility, and metabolic response to surgical stress, increasing the risk of complications, infections, and prolonged recovery. Fat-free mass plays a crucial role in immune function, wound healing, and inflammatory response, highlighting the importance of its assessment and monitoring, particularly in the perioperative period. The isolated use of BMI may mask these alterations, as it does not distinguish between fat and muscle mass, potentially leading to a false perception of normal nutritional status in patients with significant muscle loss [19,20].

Therefore, international recommendations advocate the inclusion of complementary indicators, such as weight loss and muscle mass, to avoid underestimation of nutritional risk [21,22]. This approach is particularly relevant in colorectal surgery, where sarcopenic obesity or masked malnutrition may negatively influence postoperative recovery.

Nearly half of the patients were classified as being at nutritional risk (NRS-2002 ≥3), a value consistent with the ranges reported in the literature, where the prevalence of nutritional risk or malnutrition in colorectal surgery varies between 30% and 60% [23]. This finding reinforces the importance of systematic screening, as nutritional risk is associated with a higher likelihood of complications and prolonged hospital stay. The implementation of preoperative nutritional optimization strategies, such as oral nutritional supplementation and early postoperative oral feeding, aligns with ESPEN recommendations [12] and contributes to the success of the ERAS® methodology. These results address the second objective of the study, confirming that early nutritional risk assessment is essential to guide individualized interventions and prevent adverse outcomes.

The most prevalent comorbidities were cardiovascular disease (60.9%) and diabetes mellitus (34.8%), both common in patients undergoing colorectal surgery and associated with increased metabolic complexity during the perioperative period. In particular, diabetes requires strict glycemic control, as recommended in ERAS® guidelines, to reduce complications and improve wound healing [24].

In addition to comorbidities, lifestyle habits such as alcohol consumption and smoking may have contributed to increased metabolic and inflammatory vulnerability during the perioperative period. These behaviors are associated with poorer surgical outcomes, including delayed wound healing, increased risk of infections, and prolonged hospitalization. The ERAS® methodology emphasizes smoking cessation and moderation of alcohol intake in the weeks preceding surgery to optimize physiological response to surgical stress and enhance recovery.

Regarding tumor location, cases were distributed throughout the colorectal tract, with a higher prevalence in the sigmoid colon and rectum. This distribution is consistent with national and international epidemiological data, which identify the sigmoid colon as the most frequently affected segment [25,26]. In terms of surgical techniques, right hemicolectomy was the most common procedure (39.1%), followed by sigmoidectomy and rectal resections. All procedures were performed laparoscopically, an approach recommended by the ERAS® Society due to its association with reduced inflammatory response, lower postoperative pain, and faster functional recovery [24].

The combination of surgical and nutritional strategies highlights the effectiveness of a multidisciplinary, patient-centered approach. In the present study, all patients received structured nutritional intervention in accordance with ERAS® Society [5] and ESPEN guidelines [12]. This intervention included individualized counseling and dietary strategies aimed at optimizing metabolic reserves and reducing complications. Scientific evidence shows that nutritional prehabilitation programs improve surgical tolerance and reduce length of hospital stay [27]. These findings address the first objective, demonstrating that the integration of nutritional strategies within the ERAS® framework has a direct impact on recovery and hospitalization duration.

Statistical analysis confirmed that nutritional risk was associated with longer hospital stay, reinforcing the predictive role of the NRS-2002. Among patients aged ≥65 years, normal weight was associated with shorter hospital stay, whereas overweight was associated with longer hospitalization, consistent with evidence linking obesity and subclinical inflammation to poorer outcomes [28].

Comorbidities and the number of postoperative complications also showed a significant impact on length of hospital stay. A total of 39 complications were recorded among 23 patients, predominantly hemorrhagic, gastrointestinal, and metabolic in nature. The statistically significant association between the number of complications and length of hospital stay confirms that adverse events are major determinants of prognosis [29,30].

When compared with the previous study conducted at the same institution in a pre-ERAS® context, a marked reduction in both the number and severity of complications, as well as in mean length of hospital stay, was observed. This improvement reflects the progressive implementation of ERAS® recommendations, particularly structured nutritional intervention, and supports the

first objective by demonstrating the effectiveness of ERAS® compared to traditional care models [31].

Following the analysis of clinical and nutritional indicators, it became relevant to assess the overall impact of surgical and nutritional intervention from the patient's perspective. Quality of life assessment, using the EORTC QLQ-CR29 questionnaire, identified relevant changes across multiple functional and symptomatic domains. This instrument proved sensitive in capturing colorectal surgery–specific dimensions, complementing clinical evaluation [32,33].

In the urinary domain, a transient increase in urinary frequency and dysuria was observed, particularly among males, symptoms commonly associated with pelvic manipulation and reversible autonomic changes [33,34]. In the gastrointestinal domain, symptoms such as abdominal pain and altered bowel function were generally mild and self-limited, reflecting the physiological response to surgical trauma. Early oral feeding and individualized nutritional support played a key role in functional recovery and prevention of postoperative ileus [5].

Among patients with a stoma, mild symptoms were reported (e.g., involuntary gas release, occasional need to change the stoma bag), with no peristomal skin irritation, suggesting good technical adaptation and adequate follow-up. The literature indicates that complications such as leakage and skin irritation can negatively impact quality of life but may be mitigated through patient education and interdisciplinary support [3].

In patients without a stoma, the low frequency of fecal leakage and adequate bowel function are consistent with effective intestinal adaptation within the ERAS® framework, where early feeding contributes to faster return of bowel function and shorter hospital stays.

Body image analysis revealed slight sex-related differences, with greater psychosocial vulnerability observed in females, as reported in the literature. However, the overall low mean scores suggest a generally positive perception and good emotional adaptation [36]. In the domain of sexual function, reduced interest in sexual activity was observed, particularly among males, a finding commonly reported within the first postoperative year [37-39].

General concerns were mainly related to future health and body weight, particularly among female patients, reflecting greater awareness of health status and recovery. Overall, reported symptoms were of mild to moderate intensity, indicating a generally positive perception of quality of life. These findings address the third objective, demonstrating that perioperative nutritional intervention within the ERAS® framework contributes not only to improved clinical outcomes but also to enhanced subjective well-being in the postoperative period.

Taken together, the results of this study demonstrate that early integration of the nutritionist and the implementation of evidence-based nutritional strategies have a significant impact on functional recovery, reduction of complications, and improvement of quality of life after colorectal surgery. These findings reinforce the importance of clinical nutrition as a core component of the ERAS® methodology and modern multidisciplinary surgical care [5,12,40].

Limitations and Strengths

The present study has several characteristics that should be considered when interpreting the results. It was conducted over a relatively short period within the context of a professional internship, resulting in a limited data collection timeframe and, consequently, a small sample size. This may have reduced the statistical power of the analyses and limited the generalizability of the findings to other populations.

Additionally, data were collected in a single hospital center—located in the Autonomous Region of Madeira—reflecting the institutional reality of the General Surgery Department of Hospital Dr. Nélio Mendonça. As such, the findings may not be fully representative of other clinical settings.

The primary focus of the study was the preoperative period, given its recognized importance in surgical outcomes and complication prevention. However, the absence of a systematic postoperative nutritional assessment represents a limitation, as it restricted a more comprehensive understanding of the evolution of nutritional status and the impact of the intervention throughout the entire perioperative period.

The lack of objective monitoring of potential changes—such as weight loss, reduction in fat-free mass, or increased nutritional risk—also limited the depth of the analysis. Nevertheless, the nursing team maintained continuous surveillance and communicated with the nutritionist whenever signs of nutritional risk or clinical deterioration were identified, enabling targeted intervention and closer follow-up of more vulnerable patients.

The incomplete implementation of the ERAS® methodology may also be considered a limitation. Although all patients were managed according to nutritional recommendations and key clinical measures, some components—such as bowel preparation practices—remained in a transitional phase within the institution. This reflects the gradual shift from traditional care models to full ERAS® implementation, particularly among the medical team, which demonstrated a cautious and progressive approach to certain measures.

The presence of the researcher contributed to a rigorous and systematic collection of clinical and nutritional data. However, it should be acknowledged that the inability to directly observe all stages of hospitalization — particularly meal administration and dietary progression — may have limited the completeness of information regarding daily nutritional evolution. This limitation arose from the fact that the researcher was not exclusively dedicated to the study and was simultaneously involved in other hospital services.

Despite these limitations, the study presents several strengths. All hospitalized patients were included and followed. The prospective design, the systematic integration of nutritional assessment and intervention within the ERAS® framework, and the novel comparison between pre- and post-ERAS® periods within the same institution are key strengths. These elements enhance the practical relevance of the findings and reinforce the contribution of clinical nutrition to improving surgical care and health outcomes.

Future Perspectives

The findings of this study highlight several opportunities to further advance knowledge and improve clinical practice in the context of colorectal surgery. One of the main future directions involves conducting studies with larger and more heterogeneous samples, which would allow confirmation and generalization of the present findings, as well as exploration of differences across subgroups, such as age, sex, and nutritional status.

The inclusion of longitudinal assessments throughout the entire surgical pathway, particularly incorporating postoperative reassessment, would contribute to a more comprehensive understanding of patients' nutritional and functional evolution. Systematic monitoring of weight changes and body composition, especially lean mass, would allow a more accurate evaluation of the metabolic impact of the intervention and the role of nutrition in recovery.

Future research could also incorporate biochemical and inflammatory parameters, such as albumin, C-reactive protein, and prealbumin, to provide a more comprehensive assessment of nutritional status and the inflammatory response to surgical stress. The use of body composition assessment tools, such as multifrequency bioimpedance or the Body Composition Monitor (BCM), would further enhance analytical accuracy and enable early detection of clinically relevant changes.

Another important area for future development is the evaluation of adherence to ERAS® protocols, both from the perspective of healthcare professionals and patients. Monitoring implementation fidelity could be achieved through structured checklists, objective process indicators, and periodic clinical audits, allowing identification of gaps and reinforcement of best practices. Additionally, surveys targeting multidisciplinary teams and patient self-assessments could help identify barriers to adherence and support the development of strategies to improve implementation consistency and sustainability within institutional settings.

Finally, future studies should explore the relationship between nutritional intervention and long-term quality of life outcomes, assessing the sustained impact of nutrition on recovery, functionality, and well-being after hospital discharge. In the present study, quality of life was assessed only in the early postoperative period, up to one month after surgery, capturing immediate symptoms and functional changes. Extending this evaluation to later time points—such as three, six, and twelve months—would provide a more comprehensive understanding of health perception and the long-term impact of nutritional intervention. This longitudinal approach could also help identify predictors of better recovery and support more personalized follow-up strategies, reinforcing the role of nutrition in improving long-term health outcomes.

Overall, these perspectives highlight the need for a more comprehensive, continuous, and integrated approach, reinforcing the role of nutrition as a central pillar of surgical recovery and promoting more personalized, effective, and evidence-based care.

Conclusion

The present study evaluated the influence of perioperative nutrition on the success of the Enhanced Recovery After Surgery (ERAS®) methodology in patients undergoing elective colorectal surgery.

A reduction in the mean length of hospital stay to 8 ± 6.5 days was observed, compared to 13 days in the pre-ERAS® period, reflecting the positive impact of ERAS® implementation on clinical recovery. Postoperative complications, predominantly infectious, urinary, and cardiovascular, were observed at a lower frequency compared to the previous care model.

The findings regarding the proportion of patients at nutritional risk—associated with longer hospital stay—and the higher prevalence of overweight among individuals aged <65 years highlight the importance of early identification of nutritional risk and the implementation of individualized nutritional strategies during the perioperative period.

Quality of life assessment, performed using the EORTC QLQ-CR29 questionnaire between one week and one month after surgery, revealed mild to moderate symptoms and overall satisfactory functional recovery, indicating a positive perception of physical and emotional well-being in the postoperative period.

In summary, the integration of perioperative nutrition within the ERAS® framework contributes to reduced length of hospital stay, decreased complication rates, and improved postoperative quality of life. These findings reinforce the essential role of the nutritionist within the multidisciplinary team and highlight the importance of consolidating evidence-based nutritional practices in the Portuguese hospital setting, promoting faster, safer, and more patient-centered surgical recovery.

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