Chirurgia (2026) 121: 62-69
No. 1, January - February

http://dx.doi.org/10.21614/chirurgia.3213

Implementing ERAS in a Crisis-Stricken Healthcare System: Outcomes from Laparoscopic Colorectal Surgery in Lebanon

Michael Osseis[1], Farid Abi Habib[1], Maria AL Rachid[1], Christopher El Hadi[2], Jean Jul Sarrouf[1], Christian Mouawad[3], Ghassan Chakhtoura[1], Roger Noun[1]

[1]Department of Digestive Surgery, University Medical Center Hôtel-Dieu de France, Faculty of Medicine, Saint Joseph University of Beirut, Beirut, Lebanon
[2]Internal Medicine Department, Lebanese American University Medical Center; Beirut- Lebanon
[3]Digestive Surgery Department, Centre Hospitalier Intercommunal de Villeneuve-Saint-Georges, Greater Paris Metropolis, France

***Corresponding author:**
Dr. Christian Mouawad
Department of Digestive Surgery
Centre Hospitalier Intercommunal
de Villeneuve-Saint-Georges
Greater Paris Metropolis, France
E-mail: christianmouawad18@gmail.com

Abbreviations:
ERAS: Enhanced Recovery After Surgery:
ICU: Intensive Care Unit;
ASA: American Society of Anesthesiology.

Rezumat

Implementarea ERAS într-un sistem de sănătate afectat de criză: rezultatele chirurgiei colorectale laparoscopice în Liban

Introducere: Sistemul de sănătate din Liban s-a confruntat cu provocări semnificative ca urmare a crizelor politice şi economice prelungite. În acest context, îngrijirea chirurgicală cost eficientă este esențială. Protocoalele Enhanced Recovery After Surgery (ERAS), adoptate pe scară largă la nivel global, s-au dovedit a îmbunătăți recuperarea postoperatorie, a reduce complicațiile şi a scurta durata spitalizării. În 2023, centrul nostru terțiar a implementat protocoale ERAS pentru chirurgia colorectală.
Materiale şi Metode: Acest studiu a analizat prospectiv 72 de pacienți în cazul cărora s-au practicat intervenții chirurgicale colorectale laparoscopice, elective între 2023 şi 2024. Parcursul ERAS a inclus educație preoperatorie standardizată, tehnici minim invazive intraoperatorii cu optimizarea anesteziei şi a hidratării intravenoase, precum şi mobilizare şi alimentație precoce postoperatorie asociate cu analgezie multimodală cu evitarea administrării de opioide. Rezultatele primare au fost durata spitalizării, rata complicațiilor şi frecvența reinternărilor.
Rezultate: Durata mediană a spitalizării a fost de 4 zile. Ratele de respitalizare şi de internare în terapie intensivă au fost scăzute, de 1,39% şi, respectiv, 2,7%. Doar 16% dintre pacienți au necesitat morfină postoperator. Mobilizarea şi reluarea alimentației orale precoce au fost realizate în aproape toate cazurile, cu necesar minim de transfuzie de sânge (4,17%).
Concluzie: Implementarea ERAS în chirurgia colorectală laparoscopică s-a dovedit fezabilă şi a evidențiat rezultate perioperatorii promițătoare, chiar şi în condițiile constrângerilor sistemului de sănătate din Liban. Având în vedere designul observațional şi absența unui grup de control, nu se pot formula inferențe cauzale. Cu toate acestea, protocolul a fost asociat cu durată scurtă de spitalizare, rate scăzute de complicații şi reducerea utilizării de opioide, susținând aplicabilitatea sa în contexte cu resurse limitate.

Received: 03.09.2025
Accepted: 06.12.2025

Cuvinte cheie: ERAS, chirurgie colorectală, recuperare postoperatorie, sistem de sănătate cu resurse limitate, siguranța pacientului

Abstract

Introduction: Lebanon's healthcare system has faced significant challenges due to prolonged political and economic crises. In this context, cost-effective surgical care is essential. Enhanced Recovery After Surgery (ERAS) protocols, widely adopted globally, have been shown to improve postoperative recovery, reduce complications, and shorten hospital stays. In 2023, our tertiary care center implemented ERAS protocols for colorectal surgery.

Materials and Methods: We prospectively analyzed outcomes for 72 patients who underwent elective laparoscopic colorectal surgery between 2023 and 2024. The ERAS pathway included standardized preoperative education, intraoperative minimally invasive techniques with optimized anesthesia and fluid management, and postoperative early mobilization and feeding with multimodal, opioid-sparing analgesia. Primary outcomes were length of hospital stay, complication rates, and readmissions.

Results: The median hospital stay was 4 days. Readmission and ICU admission rates were low at 1.39% and 2.7%, respectively. Only 16% of patients required postoperative morphine. Early ambulation and oral intake were achieved in nearly all cases, with minimal need for blood transfusion (4.17%).

Conclusion: ERAS implementation in laparoscopic colorectal surgery demonstrated feasibility and showed promising perioperative outcomes, even within the constraints of Lebanon's strained healthcare system. Given the observational design and absence of a control group, causal inferences cannot be drawn. Nevertheless, the protocol was associated with short hospital stay, low complication rates, and limited opioid use, supporting its applicability in resource-limited settings.

Keywords: ERAS, colorectal surgery, postoperative recovery, low-resource healthcare, patient safety

Introduction

Colorectal surgery represents a cornerstone of gastrointestinal surgical care, particularly for the management of colorectal cancer. In recent years, Enhanced Recovery After Surgery (ERAS) protocols have revolutionized perioperative care by standardizing best practices across preoperative, intraoperative, and postoperative phases. These evidence-based pathways have been shown to accelerate recovery, reduce complications, and shorten hospital stays, while improving patient satisfaction and reducing healthcare costs. Optimized perioperative care is now considered essential in elective colorectal surgery, and international guidelines support widespread adoption of ERAS principles (1). The ERAS Society recently published updated recommendations for perioperative care in elective colorectal surgery, providing evidence-based guidance on multimodal elements that optimize recovery (2).

In Lebanon, where the healthcare system has been severely impacted by economic collapse, the COVID-19 pandemic, and the Beirut port explosion, there is a critical need for efficient, high-impact interventions that improve outcomes without increasing costs. In this context, ERAS protocols offer a practical solution by preserving hospital resources while enhancing surgical recovery (3). Fast-track programs have already demonstrated success in improving outcomes following colorectal surgery, including reduced morbidity, shorter hospital stays, and fewer readmissions (4).

Despite global progress, ERAS implementation remains limited in low- and middle-income countries due to resource constraints and variability in infrastructure. This study presents the first cohort in Lebanon to undergo elective laparoscopic colorectal surgery under an ERAS protocol, aiming to assess early outcomes and demonstrate its feasibility in a resource-limited setting.

Materials and Methods

This prospective analysis included 72 patients who underwent laparoscopic colorectal surgery between 2023 and 2024 at a tertiary medical center in Lebanon. Patients included in the ERAS program and elective laparoscopic colectomy, mainly for colorectal cancer, met the inclusion criteria. Patients who underwent urgent colorectal surgery (e.g., occlusion or peritonitis), as well as those with

severe comorbidities requiring planned postoperative ICU admission, were excluded.

Comprehensive data was collected for each patient, covering demographic, preoperative, intraoperative, and postoperative phases.

Patient demographics, including age, sex, weight, body mass index (BMI), American Society of Anesthesiologists (ASA) score, and relevant comorbidities, were collected.

During the preoperative phase, all patients received structured education and counseling regarding their hospitalization and the ERAS protocol, emphasizing active participation in recovery, and a booklet on patient education for colorectal cancer surgery was given in Arabic, English, and French. Nutritional optimization strategies included preoperative carbohydrate loading for non-diabetic patients and a patented immune-supporting nutritional supplement given 1 week before surgery. Preoperative fasting was 6 hours for solids and 2 hours for liquids, with bowel preparation performed for left colectomy and coloproctectomy, while no preparation was done for right colectomy. All patients received metronidazole 500 mg every 8 hours 24 hours before surgery.

During the intraoperative phase, all surgeries were performed using minimally invasive laparoscopic techniques, with anesthetic management including the administration of oxynorm for perioperative pain control. Operative stress was managed with perioperative steroids, and optimal fluid management strategies were used to maintain hemodynamic stability. Intra-abdominal drainage was avoided unless clinically necessary, particularly for infra-peritoneal anastomoses, where drains were placed next to the anastomosis. Infection prevention included a perioperative dose of Ceftriaxone and metronidazole. Hypothermia was prevented during induction, surgery, and patient awakening. The duration of surgery and type of surgery (right colectomy, left colectomy, proctectomy, or Low Anterior Resection) were noted, along with the need for stoma diversion, especially in proctectomy. Surgical techniques were tailored based on tumor location, such as right colectomy with complete mesocolon excision for caecal, right colic, and right angle flexure tumors, and left colectomy with left mesocolic excision for left angle, left colic and sigmoid colon, partial mesorectal and complete left mesocolon excision for high rectal tumors, with a total mesorectal excision for mid and low rectal tumors.

In the postoperative phase, patients were encouraged to ambulate within 24 hours, and prophylactic anticoagulation was administered to prevent thromboembolic events. Postoperative antibiotics were given for 48 hours to prevent infections, and multimodal pain management included paracetamol, nefopam, antispasmodics, and antiemetics, with limited morphine use. Prevention of postoperative ileus involved encouraging patients to chew, and no nasogastric tubes were used. Nutrition and hydration were managed with early oral intake, progressing from clear fluids to solid foods. Foley catheters were used perioperatively and typically removed post-surgery, with timing recorded. Postoperative complications, including surgical site infections, ileus, bleeding, and readmissions, were recorded, along with length of hospital stay. Complications were classified according to the Clavien-Dindo classification. ERAS protocol adherence was assessed as the proportion of protocol elements fulfilled per patient. Overall compliance was calculated as a global adherence rate.

A multidisciplinary approach involving nurses and nutritionists provided patient counseling, and nutritionists explained post-discharge diet, typically a low-fiber diet for 2 weeks. Patients were seen in the outpatient clinic 1 week after discharge for a detailed physical exam.

Primary outcomes included hospital length of stay, postoperative complications, and adherence to the ERAS protocol. Secondary outcomes assessed included patient mobilization, time to oral intake, and use of opioid and non-opioid analgesia.

Results

Patient Demographics

The study included slightly more males (55.56%) than females (44.44%) overall. The majority of our patients across all groups were treated for neoplasm. The vast majority of patients in all groups had an ASA score ≥ 2, indicating moderate to severe systemic disease. Regarding co-morbidities, a significant portion of patients in all groups had a history of pulmonary issues (44%), and over half of all patients had a cardiac history. A lower percentage of patients had diabetes (23.61% overall) (*Table 1*).

Preoperative Radio / Chemotherapy

Preoperative radiotherapy was more common in the proctectomy group (64.29%) compared to the other groups. Preoperative chemotherapy was administered to 50% of the proctectomy group (*Table 2*).

Table 1. Patients' demographics

Variable	Category	All: Frequency	Proctectomy: Frequency	Colectomy, Right: Frequency	Colectomy, Left: Frequency
Sex	Female	32 (44.44%)	7 (50%)	15 (50%)	10 (37.04%)
	Male	40 (55.56%)	7 (50%)	15 (50%)	17 (62.96%)
Etiology	Neoplasm	59 (81.94%)	13 (92.86%)	28 (93.33%)	18 (66.67%)
	Diverticulitis	6 (8.33%)	-	-	6 (22.22%)
	Other	7 (9.72%)	1 (7.14%)	2 (6.67%)	3 (11.11%)
ASA	≥ 2	68 (94.44%)	14 (100%)	28 (93.33%)	25 (92.59%)
	< 2	4 (5.56%)	-	2 (6.67%)	2 (7.41%)
History: Pulmonary	Yes	32 (44.44%)	8 (57.14%)	14 (46.67%)	9 (33.33%)
	No	40 (55.56%)	6 (42.86%)	16 (53.33%)	18 (66.67%)
History: Cardiac	Yes	37 (51.39%)	4 (28.57%)	21 (70%)	12 (44.44%)
	No	35 (48.61%)	10 (71.43%)	9 (30%)	15 (55.56%)
History: Diabetes	No	55 (76.39%)	12 (85.71%)	20 (66.67%)	22 (81.48%)
	Yes	17 (23.61%)	2 (14.29%)	10 (33.33%)	5 (18.52%)
Properative Radiotherapy	No	62 (86.11%)	5 (35.71%)	29 (96.67%)	27 (100%)
	Yes	10 (13.89%)	9 (64.29%)	1 (3.33%)	-
Preoperative Chemotherapy	No	64 (88.89%)	7 (50%)	30 (100%)	26 (96.3%)
	Yes	8 (11.11%)	7 (50%)	-	1 (3.7%)

Table 2. Pathology demographics division

Variable	Category	All: Frequency	Proctectomy: Frequency	Colectomy, Right: Frequency	Colectomy, Left: Frequency	p-value
Procedure	Proctectomy	14 (19.44%)	14 (100%)	-	-	
	Colectomy, Right	30 (41.67%)	-	30 (100%)	-	
	Colectomy, Left	27 (37.5%)	-	-	27 (100%)	
	Colectomy, Total	1 (1.39%)	-	-	-	
Localization	Rectum, Middle	11 (15.28%)	11 (78.57%)	-	-	
	Colon, Right	16 (22.22%)	-	16 (53.33%)	-	
	Colon, Left	13 (18.06%)	1 (7.14%)	-	12 (44.44%)	
	Colon, Transverse	4 (5.56%)	-	4 (13.33%)	-	
	Caecum	9 (12.5%)	-	9 (30%)	-	
	Sigmoid	14 (19.44%)	-	-	14 (51.85%)	
	Rectum, Lower	2 (2.78%)	2 (14.29%)	-	-	
	Right Angle	1 (1.39%)	-	1 (3.33%)	-	
	Rectum, Upper	1 (1.39%)	-	-	1 (3.7%)	
	Total	1 (1.39%)	-	-	-	
Pathology	Low Grade	43 (59.72%)	8 (57.14%)	21 (70%)	14 (51.85%)	0.171
	High Grade	9 (12.5%)	2 (14.29%)	4 (13.33%)	3 (11.11%)	
	Diverticulitis	5 (6.94%)	-	-	5 (18.52%)	
	Mucinous Adenocarcinoma	8 (11.11%)	2 (14.29%)	4 (13.33%)	2 (7.41%)	
	Signet ring cell carcinoma	1 (1.39%)	1 (7.14%)	-	-	
	Inflammatory	6 (8.33%)	1 (7.14%)	1 (3.33%)	3 (11.11%)	

Surgical Procedures & Disease

The study included a total of 72 patients, with a focus on proctectomy (19.44%), right colectomy (41.67%), and left colectomy (37.5%). Only one patient had a total colectomy (1.39%). The most frequent tumor locations were the colon, right (22.22%) and the sigmoid (19.44%). The middle rectal tumor was also common (15.28%) in patients. Most of the patients had a low-grade pathology. The rates of high-grade pathology, diverticulitis, mucinous adenocarcinoma, and inflammatory pathology were lower across all procedure groups (*Table 2*).

Patient Presentation & Context

A significant number of patients presented with anaemia or melena (44.44%), with higher rates in the proctectomy group (57.14%). While over half of all patients presented with an occlusion (*Table 3*).

Table 3. Patients' presentations

Variable	Category	All: Frequency	Proctectomy: Frequency	Colectomy, Right: Frequency	Colectomy, Left: Frequency	p-value
Context: Anaemia/Melena	No	40 (55.56%)	6 (42.86%)	17 (56.67%)	17 (62.96%)	0.495
	Yes	32 (44.44%)	8 (57.14%)	13 (43.33%)	10 (37.04%)	
Context: Occlusion	No	35 (48.61%)	6 (42.86%)	15 (50%)	14 (51.85%)	0.898
	Yes	37 (51.39%)	8 (57.14%)	15 (50%)	15 (51.85%)	
Context: Pain	No	54 (75%)	12 (85.71%)	21 (70%)	16 (51.85%)	0.597
	Yes	18 (25%)	2 (14.29%)	9 (30%)	17 (51.85%)	

ERAS Protocol Outcomes

Overall ERAS adherence rate was 87%, with highest compliance observed for early mobilization (96%), early oral intake (93%), and multimodal analgesia (100%). The median operation time was significantly higher in the proctectomy, and LAR group (276 minutes) compared to the right colectomy (142 minutes) and left colectomy (230 minutes) groups. The median duration of stay was 4 days across all groups. Although median length of stay was similar across groups, the statistically significant p-value ($p<0.001$) reflects differences in data distribution rather than differences in median values. The median day on which patients broke their fast was day 0 for proctectomy and right colectomy patients but day 1 for left colectomy patients (*Table 4*).

During surgery, all patients had a Foley catheter inserted at the time of surgery. We tend to remove the Foley catheter immediately in the post-operative phase and for the LAR group maximum at day 2. In addition, a large portion of the patients had a drain placed with the highest rates in the left colectomy and proctectomy groups. The drain was removed mostly on days 3 or 4.

Postoperative complications were predominantly minor: Clavien–Dindo grade I–II occurred in 13.9% of patients, while grade III complications occurred in 2.8%. No grade IV or V complications were observed. After surgery, a minority of patients required morphine. The patients on morphine were

Table 4. ERAS Characteristics

Variable	Category	All: Frequency	Proctectomy: Frequency	Colectomy, Right: Frequency	Colectomy, Left: Frequency	p-value
Foley Catheter	Yes	59 (81.94%)	14 (100%)	21 (70%)	25 (51.85%)	0.046
	No	13 (18.06%)	-	9 (30%)	26 (51.85%)	
If kept, date of Foley Catheter removal?	3	5 (8.47%)	5 (35.71%)	-	-	<0.001
	2	21 (35.6%)	8 (57.14%)	-	13 (48.15%)	
	1	19 (32.21%)	1 (7.14%)	9 (30%)	8 (29.63%)	
	0	14 (23.72%)	-	12 (40%)	2 (7.41%)	
Morphin	Yes	12 (16.67%)	6 (42.9%)	2 (6.7%)	4 (14.8%)	0.016
	No	60 (83.33%)	8 (57.1%)	28 (93.3%)	23 (85.2%)	
If required, days on Morphin?	2	9 (12.5%)	4 (28.6%)	2 (6.7%)	3 (11.1%)	0.033
	1	3 (4.2%)	2 (14.3%)	-	1 (3.7%)	
	0	60 (83.3%)	8 (57.1%)	28 (93.3%)	23 (85.2%)	
Readmission	No	71 (98.6%)	13 (92.9%)	30 (100%)	27 (100%)	0.192
	Yes	1 (1.4%)	1 (7.1%)	-	-	
If readmitted, when?	13	1 (100%)	1 (7.14%)	-	-	0.368
Postoperative Blood Transfusion	No	69 (95.8%)	14 (100%)	28 (93.3%)	26 (96.3%)	1
	Yes	3 (4.2%)	-	2 (6.7%)	1 (3.7%)	
Postoperative ICU Admission	Yes	2 (2.8%)	1 (7.1%)	1 (3.3%)	-	0.499
	No	70 (97.2%)	13 (92.9%)	29 (96.7%)	27 (100%)	
Drain	Yes	32 (44.4%)	11 (78.6%)	4 (13.3%)	17 (63%)	<0.001
	No	40 (55.6%)	3 (21.4%)	26 (86.7%)	10 (37%)	
If placed, day of drain removal	5	5 (15.6%)	1 (7.14%)	-	3 (11.11%)	0.571
	4	12 (37.5%)	3 (21.43%)	1 (3.33%)	8 (29.63%)	
	3	13 (40.64%)	6 (42.86%)	3 (10%)	4 (14.81%)	
	2	2 (6.26%)	1 (7.14%)	-	2 (7.4%)	

Table 5. Resume of outcomes of patients' management through ERAS protocol

Variable	All (n=72)	Proctectomy (n=14)	Right colectomy (n=30)	Left colectomy (n=27)	p-value
Age (years), median [IQR]	66 [58–73]	62 [55–70]	70 [62–76]	67 [60–74]	0.045
Length of stay (days), median [IQR]	4 [3–5]	4 [4–5]	4 [3–6]	4 [4–5]	<0.001*
Day of oral intake	0 [0–1]	0 [0–1]	0 [0–1]	1 [0–2]	<0.001
Operative Time (min)	202 [143–276]	276 [210–345]	142 [115–180]	230 [185–290]	<0.001
ICU admission (%)	2.8%	7.1%	3.3%	0%	0.499

mostly in the left colectomy group. Only three patients in our study group required postoperative blood transfusions. These patients had a median hemoglobin level of 6.5 and cardiological comorbidities. The need for postoperative ICU admission was also very low 2.7%, mainly due to pulmonary underlying causes (*Table 1*). Moreover, patient mobilization began on the day of the procedure (day 0). From our 72 patients, only 1 patient was readmitted within the following month (*Table 5*).

Discussion

Several sources emphasize that ERAS protocols are designed to reduce the stress response to surgery and facilitate quicker recovery (5). Our study aligns with this by reporting a relatively short median length of stay (4 days) across all surgical groups. ERAS aims to minimize postoperative complications, reduce hospital stay, and optimize patient recovery (6). These goals are consistent with the outcomes reported in our research where low readmission rates and low ICU admissions were observed.

Our study found a median length of stay of 4 days. This is consistent with other studies showing that ERAS protocols lead to significantly reduced hospital stays. A meta-analysis in one source reported a reduction of 2.94 days in length of stay with ERAS protocols (4). Varadhan et al (7) showed that length of stay was reduced by 2.51 days. The Cochrane meta-analyses showed also a very low readmission rate around 12/1000 (5). Concerning readmission, we reported low readmission rates overall, aligning with the statement that ERAS implementation in colorectal surgery does not cause an increase in readmissions (4,7-9).

The data showed that the median day patients broke their fast was on the day of surgery (day 0) for proctectomy and right colectomy patients, but on post operative day 1 for left colectomy patients. This emphasis on early oral feeding is a key component of ERAS protocols as highlighted in multiple sources (10,11). The sources also highlight the importance of early mobilization (12,13), which was adopted systematically to all our patients.

A notably low need for additional interventions, such as blood transfusions, ICU admissions, and opioid analgesia, was observed in our data, which comes in accordance with many observational and randomized control trials stating that ERAS is associated with a reduction in overall complications and morbidity (8,9,14-16). The data shows that most patients do not use morphine, indicating effective pain control in the ERAS protocol. As suggested by Alfonsi et al (17), we endorsed the use of multimodal analgesia, including local anesthetics, and we noted a reduction in the use of morphine, conforming with other studies (18,19) which concluded that ERAS protocols in colorectal surgery reduce opioid requirements.

In adherence with ERAS recommendations (6), we emphasized on Foley removal post operative directly and drain removal when inserted on day 3 maximum. This helped the patients work on their mobilization since day 0. Resources have highlighted the importance of drainage removal in discharging patients as soon as possible (17,20,21), confirmed by a prospective randomized controlled study (22) comparing the rate of acute urinary retention after immediate versus early Foley removal in patients undergoing minimally invasive colonic resection, and concluding a non-inferiority of immediate versus 24-h Foley removal.

Our study presents data from a single center and does not include a conventional care control group, which can limit the results. However, seeing the evidence-based positive impact of the ERAS protocol, it is considered unethical not to include all patients in the process. The absence of a conventional-care control group limits direct comparison and precludes definitive effectiveness claims. Our findings should therefore be interpreted as feasibility and outcome signals rather than proof of superiority. Being a colorectal surgery center that provides high quality care to its

patients despite the current situation in Lebanon (23), our study showcased the adherence to ERAS pre, per and post operative management resulting in standardized quality care to all our patients. Our adherence to protocol elements aligns with the updated ERAS Society recommendations (2), reinforcing the applicability of these evidence-based practices despite resource limitations.

The standardization of perioperative care remains a crucial but difficult goal, as there exists variations in the implementation and outcomes of ERAS between high-income and low-middle income countries (24). While our project evaluates the outcomes of a specific ERAS protocol, there is still no universally accepted standard that encompasses all key facets of enhanced recovery. Additionally, successful ERAS implementation relies on a multidisciplinary approach, emphasizing collaboration among healthcare professionals. Further research is essential assessing the individual components of ERAS protocols, long-term outcomes, and cost-effectiveness. Addressing these gaps will help refine ERAS guidelines and improve patient care.

Conclusions

The implementation of an ERAS protocol for laparoscopic colorectal surgery in Lebanon demonstrated feasibility and showed promising perioperative outcomes despite the constraints of a crisis-stricken, resource-limited healthcare system. The observed short hospital stay, low complication and readmission rates, and limited opioid requirements suggest that structured perioperative care pathways can be successfully implemented even in challenging settings.

However, the interpretation of these findings must take into account the observational nature of the study, its single-center design, and the absence of a conventional-care control group, which preclude definitive conclusions regarding effectiveness or superiority. Rather than proving efficacy, this study provides real-world evidence supporting the practical applicability and safety of ERAS protocols in this context.

Further multicenter studies with comparative designs are warranted to better quantify the impact of ERAS implementation on clinical outcomes, resource utilization, and long-term patient recovery, particularly in low- and middle-income countries facing systemic healthcare challenges.

Conflicts of Interest

The authors declare no conflicts of interest.

Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board (or Ethics Committee) of Saint Joseph University Faculty of Medicine (2340) on the 29th of January 2024.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The original contributions presented in this study are included in the article/supplementary material. Further inquiries can be directed to the corresponding author.

References

1. Schwenk W. Optimized perioperative management (fast-track, ERAS) to enhance postoperative recovery in elective colorectal surgery. GMS Hyg Infect Control. 2022;17:Doc10.
2. Gustafsson UO, Rockall TA, Wexner S, How KY, Emile S, Marchuk A, et al. Guidelines for perioperative care in elective colorectal surgery: Enhanced Recovery After Surgery (ERAS) Society recommendations 2025. Surgery. 2025;184:109397.
3. Meillat H, Serenon V, Brun C, de Chaisemartin C, Faucher M, Lelong B. Impact of fast-track care program in laparoscopic rectal cancer surgery: a cohort-comparative study. Surg Endosc. 2022;36(7):4712-4720.
4. Spanjersberg WR, Reurings J, Keus F, van Laarhoven CJ. Fast track surgery versus conventional recovery strategies for colorectal surgery. Cochrane Database Syst Rev. 2011;(2):CD007635.
5. Khoo CK, Vickery CJ, Forsyth N, Vinall NS, Eyre-Brook IA. A prospective randomized controlled trial of multimodal perioperative management protocol in patients undergoing elective colorectal resection for cancer. Ann Surg. 2007;245(6):867-872.
6. Kehlet H. Fast-track colorectal surgery. Lancet Lond Engl. 2008;371(9615):791-793.
7. Varadhan KK, Neal KR, Dejong CHC, Fearon KCH, Ljungqvist O, Lobo DN. The enhanced recovery after surgery (ERAS) pathway for patients undergoing major elective open colorectal surgery: a meta-analysis of randomized controlled trials. Clin Nutr Edinb Scotl. 2010;29(4):434-440.
8. Adamina M, Kehlet H, Tomlinson GA, Senagore AJ, Delaney CP. Enhanced recovery pathways optimize health outcomes and resource utilization: a meta-analysis of randomized controlled trials in colorectal surgery. Surgery. 2011;149(6):830-840.
9. Ban KA, Berian JR, Ko CY. Does Implementation of Enhanced Recovery after Surgery (ERAS) Protocols in Colorectal Surgery Improve Patient Outcomes? Clin Colon Rectal Surg. 2019;32(2):109-113.
10. Jochum SB, Ritz EM, Bhama AR, Hayden DM, Saclarides TJ, Favuzza J. Early feeding in colorectal surgery patients: safe and cost effective. Int J Colorectal Dis. 2020;35(3):465-469.
11. Gianotti L, Nespoli L, Torselli L, Panelli M, Nespoli A. Safety, feasibility, and tolerance of early oral feeding after colorectal resection outside an enhanced recovery after surgery (ERAS) program. Int J Colorectal Dis. 2011;26(6):747-753.

12. van der Storm SL, Jansen M, Mulder MD, Marsman HA, Consten, den Boer FC, et al. Improving Enhanced Recovery after Surgery (ERAS): The Effect of a Patient-Centred Mobile Application and an Activity Tracker on Patient Engagement in Colorectal Surgery. Surg Innov. 2025;32(1):5-15.
13. Zhang Q, Sun Q, Li J, Fu X, Wu Y, Zhang J, et al. The Impact of ERAS and Multidisciplinary Teams on Perioperative Management in Colorectal Cancer. Pain Ther. 2025;14(1):201-215.
14. Lv L, Shao YF, Zhou Yb. The enhanced recovery after surgery (ERAS) pathway for patients undergoing colorectal surgery: an update of meta-analysis of randomized controlled trials. Int J Colorectal Dis. 2012;27(12):1549-1554.
15. Thiele RH, Rea KM, Turrentine FE, Friel CM, Hassinger TE, McMurry TL, et al. Standardization of care: impact of an enhanced recovery protocol on length of stay, complications, and direct costs after colorectal surgery. J Am Coll Surg. 2015;220(4):430-443.
16. Teeuwen PHE, Bleichrodt RP, Strik C, Groenewoud JJM, Brinkert W, van Laarhoven CJH M, et al. Enhanced recovery after surgery (ERAS) versus conventional postoperative care in colorectal surgery. J Gastrointest Surg Off J Soc Surg Aliment Tract. 2010;14(1):88-95.
17. Alfonsi P, Slim K, Chauvin M, Mariani P, Faucheron JL, Fletcher D; et al. French guidelines for enhanced recovery after elective colorectal surgery. J Visc Surg. 2014;151(1):65-79.
18. Lee A, Shelton E, Bidwell S, Shankar K, Ando K, Gaudilliere B, et al. Association of Prehabilitation With Postoperative Opioid Use in Colorectal Surgery: An Observational Cohort Study. J Surg Res. 2022;273:226-232.
19. Kawak S, Wasvary JF, Ziegler MA. Opioid Requirements in Laparoscopic Colectomies: Do Enhanced Recovery After Surgery Protocols Make a Difference? Am Surg. 2021;87(7):1048-1053.
20. Schreiber A, Aydil E, Walschus U, Glitsch A, Patrzyk M, Heidecke CD, et al. Early removal of urinary drainage in patients receiving epidural analgesia after colorectal surgery within an ERAS protocol is feasible. Langenbecks Arch Surg. 2019;404(7):853-863.
21. Althoff AL, Poulos CM, Hale JR, Staff I, Vignati PV. Acute urinary retention rates following early removal or no placement in colon and rectal surgery: a single-center analysis. Surg Endosc. 2022;36(5):3116-3121.
22. Pedrazzani C, Montroni I, Conti C, Turri G, Foppa C, Carvello M, et al. Immediate versus early (24-hours) urinary catheter removal after elective minimally invasive colonic resection: study protocol for a randomized, multicenter, non-inferiority trial. Trials. 2022;23(1):956.
23. Osseis M, Habib FA, Al Rachid M, El Hadi C, Kazan D, Mouawad C, et al. The impact of economic crisis, COVID-19, and the Beirut Blast on colorectal cancer patients in Lebanon: A trend to operate more late-stage complex cases. World J Surg. 2024;48(10):2376-2382.
24. Slim N, Teng WH, Shakweh E, Sylvester HC, Awad M, Schembri R, et al. Enhanced recovery programme after colorectal surgery in high-income and low-middle income countries: a systematic review and meta-analysis. Int J Surg Lond Engl. 2023;109(11):3609-3616.