

EVALUATING THE EFFICACY OF ENHANCED RECOVERY AFTER SURGERY (ERAS) PROTOCOLS IN PATIENTS UNDERGOING ELECTIVE COLORECTAL SURGERY

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Abstract

Background: Enhanced Recovery After Surgery (ERAS) protocols have been developed as evidence-based, multimodal perioperative care pathways aimed at reducing surgical stress, improving recovery, and minimizing complications. **Objective:** This study aimed to evaluate the efficacy of ERAS protocols in patients undergoing elective colorectal surgery. **Methods:** This prospective observational study was conducted at Shaikh Zayed hospital Lahore from October 2024 to March 2025. A total of 235 patients undergoing elective colorectal surgery were enrolled using consecutive sampling. All patients were managed according to standardized ERAS protocols, which included preoperative counseling and carbohydrate loading, opioid-sparing analgesia, avoidance of nasogastric tubes, early oral intake, and early mobilization. **Results:** The mean age of the cohort was 54.2 ± 12.7 years, with 138 males (58.7%) and 97 females (41.3%). Laparoscopic surgery was performed in 141 patients (60.0%) and open surgery in 94 patients (40.0%). The mean operative time was 168.5 ± 34.6 minutes, and the mean intraoperative blood loss was 210.3 ± 75.8 mL. Postoperative recovery was favorable, with a mean time to first bowel movement of 2.6 ± 0.9 days and mean hospital stay of 6.2 ± 2.1 days. Complications were observed in 52 patients (22.1%), the majority of which were Clavien–Dindo Grade I–II, and anastomotic leak occurred in 2.6% of cases. **Conclusion:** ERAS protocols significantly improve recovery in patients undergoing elective colorectal surgery by reducing complications, facilitating early mobilization, and shortening hospital stay without increasing readmission or mortality. The integration of laparoscopic techniques further enhances outcomes.

INTRODUCTION

Colorectal surgery remains one of the most commonly performed major abdominal procedures worldwide, but it is frequently complicated by

substantial postoperative morbidity, delayed recovery, and increased length of hospital stay [1]. Traditional perioperative care, often referred to as

the "conventional pathway," is characterized by prolonged fasting, routine use of nasogastric decompression, delayed resumption of oral intake, and extended immobilization. These approaches were historically adopted in the belief that they minimized the risk of complications, but mounting evidence has demonstrated that such practices may actually prolong recovery and increase the risk of adverse outcomes [2]. Consequently, there has been a paradigm shift in perioperative care with the introduction of Enhanced Recovery After Surgery (ERAS) protocols [3]. ERAS, first conceptualized in the 1990s by Kehlet and colleagues, represents a multimodal, evidence-based care pathway designed to attenuate the physiological stress response to surgery, reduce complications, and facilitate faster recovery. Integrating best practices throughout the entire perioperative period, from preoperative optimization to postoperative rehabilitation, is the central tenet of ERAS [4]. Core elements of the ERAS pathway include patient education and counseling, preoperative carbohydrate loading instead of prolonged fasting, the use of minimally invasive surgical techniques when possible, multimodal analgesia to minimize opioid use, avoidance of routine nasogastric tubes and drains, and early resumption of diet and mobilization [5]. Together, these treatments help speed up recovery from surgery, maintain organ function, and reduce the stress of surgery. Postoperative ileus, surgical site infections, anastomotic leaks, and cardiopulmonary complications are just a few of the unique risks associated with colorectal procedures [6]. By targeting modifiable aspects of perioperative care, ERAS pathways aim not only to reduce these risks but also to enhance patient-centered outcomes such as pain control, functional recovery, and quality of life [7]. When compared to conventional treatment, ERAS in colorectal surgery is consistently associated with shorter hospital stays, lower rates of complications, and an earlier return to bowel function [8]. This has been demonstrated by a number of large-scale randomized controlled trials and meta-analyses. Importantly, these improvements do not come at the cost of increased readmissions or mortality, reinforcing the safety of ERAS adoption [9]. Despite the robust evidence base, real-world implementation of ERAS has been variable across institutions and

healthcare systems [10]. Barriers such as limited resources, inconsistent staff training, resistance to change from conventional practices, and differences in patient populations may affect protocol compliance and outcomes [11]. Furthermore, the degree of adherence to ERAS elements has been shown to strongly correlate with clinical benefits; partial implementation often leads to suboptimal results [12]. This demonstrates the necessity of context-specific ERAS effectiveness evaluations, particularly in settings with limited resources or in hospitals where patient demographics differ from those studied in high-income nations [13].

Objective

This study aimed to evaluate the efficacy of ERAS protocols in patients undergoing elective colorectal surgery.

Methodology

This was a prospective observational study conducted at Shaikh Zayed hospital Lahore from October 2024 to March 2025. A total of 235 patients undergoing elective colorectal surgery were included in the study. Non-probability consecutive sampling was used to recruit participants who met the inclusion criteria.

Inclusion Criteria:

- Adult patients aged 18 years and above.
- Patients scheduled for elective colorectal surgery (both benign and malignant conditions).
- Patients who consented to participate in the study and adhere to the ERAS protocol.

Exclusion Criteria:

- Emergency colorectal surgeries.
- Patients with severe comorbidities precluding adherence to ERAS elements (e.g., advanced cardiac failure, severe respiratory disease).
- Patients with cognitive or psychiatric disorders impairing their ability to comply with perioperative care instructions.
- Patients requiring postoperative intensive care for non-surgical reasons.

Data Collection

Data were collected using a structured proforma. Preoperative data included demographic details (age, gender, BMI), comorbidities, and type of surgery. Intraoperative data included operative time, blood loss, and surgical approach (open vs laparoscopic). Postoperative data included time to return of bowel function, pain scores, length of hospital stay, postoperative complications (graded using the Clavien–Dindo classification), and readmission within 30 days. All patients were managed according to a standardized ERAS protocol. Preoperatively, patients underwent counseling and nutritional optimization, including carbohydrate loading and abbreviated fasting rather than traditional prolonged fasting. Intraoperatively, minimally invasive techniques were employed whenever feasible, and opioid-sparing multimodal analgesia was preferred. Routine use of nasogastric tubes and drains was avoided. Postoperatively, early initiation of oral fluids and solid diet was encouraged within 24 hours of surgery, and patients were mobilized at the earliest opportunity, generally within the first 24 hours. The primary outcome measures were length of hospital stay and postoperative complication rates. Secondary outcomes included time to return of bowel function, adequacy of pain control, patient satisfaction, and readmissions occurring within 30 days of surgery.

Statistical Analysis

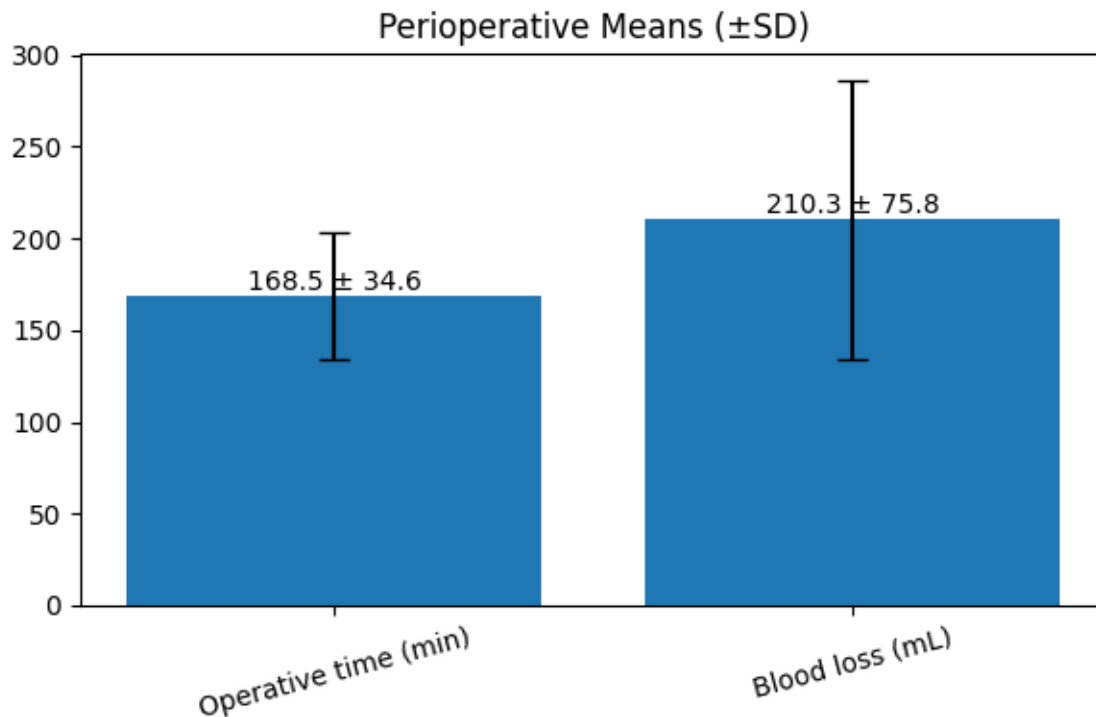
All collected data were entered and analyzed using SPSS software version 23. Continuous variables such as age, operative time, and length of stay were presented as mean $\pm$ standard deviation, while categorical variables such as gender, surgical approach, and complication rates were summarized as frequencies and percentages. A p-value of <0.05 was considered statistically significant.

Results

Data were collected from 235 patients, mean age was 54.2 ± 12.7 years, and the majority were male (138; 58.7%) compared to females (97; 41.3%). The mean body mass index (BMI) was 26.1 ± 3.9 kg/m². Hypertension was the most common comorbidity, affecting 77 patients (32.8%), followed by diabetes mellitus in 68 (28.9%), cardiovascular disease in 39 (16.6%), and chronic lung disease in 21 (8.9%). The majority of procedures were performed for malignant disease (150; 63.8%), while benign conditions accounted for 85 cases (36.2%). The mean operative time was 168.5 ± 34.6 minutes. Laparoscopic surgery was performed in 141 patients (60.0%), while 94 patients (40.0%) underwent open surgery. The mean intraoperative blood loss was 210.3 ± 75.8 mL.

Table 1. Baseline Demographic and Clinical Characteristics of Patients (N = 235)

Variable	Total (N = 235)
Age, years (mean $\pm$ SD)	54.2 ± 12.7
Gender, n (%)	Male: 138 (58.7%) Female: 97 (41.3%)
BMI, kg/m ² (mean $\pm$ SD)	26.1 ± 3.9
Hypertension, n (%)	77 (32.8%)
Diabetes mellitus, n (%)	68 (28.9%)
Cardiovascular disease, n (%)	39 (16.6%)
Chronic lung disease, n (%)	21 (8.9%)
Malignant disease, n (%)	150 (63.8%)
Benign disease, n (%)	85 (36.2%)
Operative time, minutes (mean $\pm$ SD)	168.5 ± 34.6
Surgical approach, n (%)	Laparoscopic: 141 (60.0%) Open: 94 (40.0%)
Estimated blood loss, mL (mean $\pm$ SD)	210.3 ± 75.8



The mean time to first bowel movement was 2.6 ± 0.9 days. Early mobilization within the first 24 hours was achieved in 201 patients (85.5%). Similarly, 195 patients (83.0%) tolerated oral intake within 24 hours of surgery. The overall mean length of hospital stay was 6.2 ± 2.1 days.

Table 2. Postoperative Recovery Outcomes (N = 235)

Variable	Value
Time to first bowel movement, days (mean $\pm$ SD)	2.6 ± 0.9
Early mobilization within 24 hrs, n (%)	201 (85.5%)
Oral intake within 24 hrs, n (%)	195 (83.0%)
Length of hospital stay, days (mean $\pm$ SD)	6.2 ± 2.1

Complications occurred in 52 patients (22.1%). The most frequent were postoperative ileus in 20 patients (8.5%), wound infection in 15 (6.4%), urinary tract infection in 9 (3.8%), and anastomotic leak in 6 (2.6%). According to the Clavien-Dindo classification, the majority of complications were minor (Grade I-II: 41; 78.8%), while 11 patients (21.2%) experienced major complications (Grade III-IV). Readmission within 30 days occurred in 14 patients (6.0%).

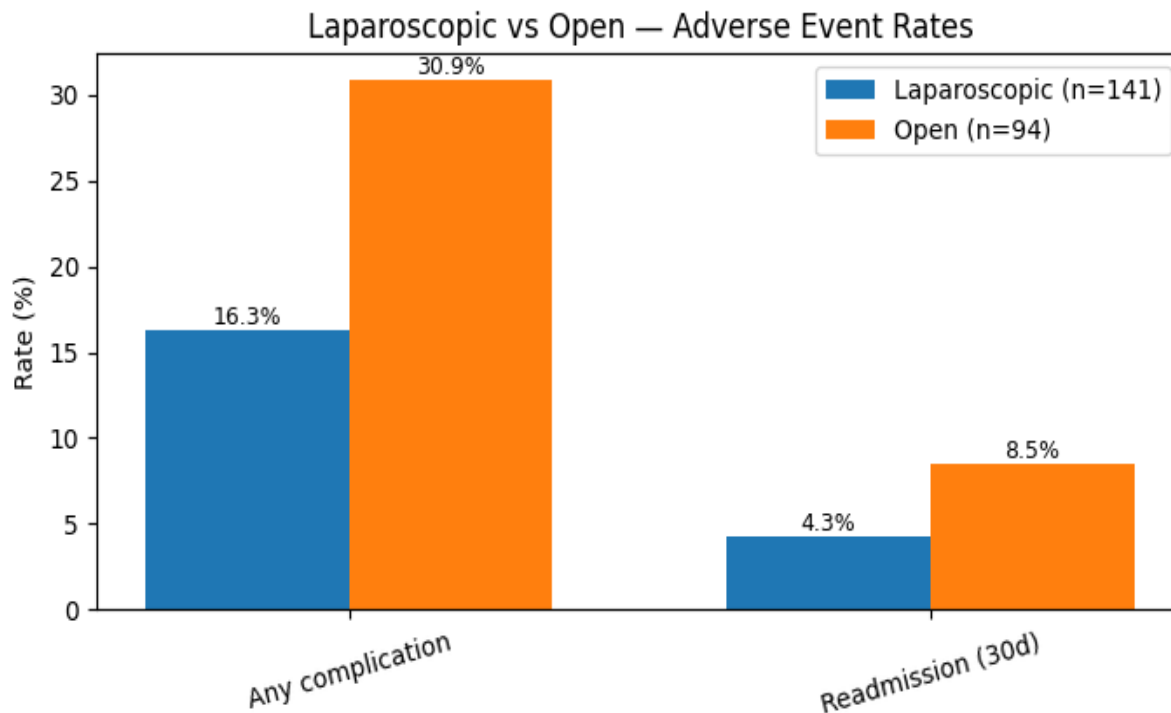
Table 3. Postoperative Complications and Readmissions (N = 235)

Variable	n (%)
Any complication	52 (22.1%)
• Ileus	20 (8.5%)
• Wound infection	15 (6.4%)
• Urinary tract infection	9 (3.8%)
• Anastomotic leak	6 (2.6%)
Clavien-Dindo Grade I-II	41 (78.8%)
Clavien-Dindo Grade III-IV	11 (21.2%)
Readmission within 30 days	14 (6.0%)
Mortality	0 (0.0%)

When comparing surgical approaches, laparoscopic procedures were associated with significantly shorter operative times (162.4 ± 31.8 vs. 177.5 ± 36.2 minutes; $p = 0.01$), lower blood loss (185.6 ± 68.2 vs. 247.9 ± 80.5 mL; $p < 0.001$), earlier return of bowel function (2.3 ± 0.8 vs. 3.1 ± 1.0 days; $p < 0.001$), and shorter hospital stays (5.4 ± 1.6 vs. 7.3 ± 2.4 days; $p < 0.001$). The complication rate was significantly lower in the laparoscopic group (16.3% vs. 30.9%; $p = 0.01$). Readmission within 30 days was slightly lower in the laparoscopic group (4.3% vs. 8.5%), although this difference was not statistically significant ($p = 0.18$).

Table 4. Comparison of Outcomes Between Laparoscopic and Open Surgery (N = 235)

Variable	Laparoscopic (n = 141)	Open (n = 94)	p-value
Operative time, minutes (mean $\pm$ SD)	162.4 ± 31.8	177.5 ± 36.2	0.01
Blood loss, mL (mean $\pm$ SD)	185.6 ± 68.2	247.9 ± 80.5	<0.001
Time to bowel movement, days (mean $\pm$ SD)	2.3 ± 0.8	3.1 ± 1.0	<0.001
Length of stay, days (mean $\pm$ SD)	5.4 ± 1.6	7.3 ± 2.4	<0.001
Any complication, n (%)	23 (16.3%)	29 (30.9%)	0.01
Readmission within 30 days, n (%)	6 (4.3%)	8 (8.5%)	0.18



Discussion

The present study evaluated the efficacy of Enhanced Recovery After Surgery (ERAS) protocols in 235 patients undergoing elective colorectal surgery. The results demonstrated that ERAS was associated with favorable clinical outcomes, including shorter hospital stay, early recovery of bowel function, low rates of complications, and minimal readmissions. These findings are consistent with previous research that has established ERAS as a safe and effective

alternative to conventional perioperative management in colorectal surgery. Our cohort achieved a mean length of stay of 6.2 ± 2.1 days, with laparoscopic patients showing significantly shorter stays compared to open procedures (5.4 vs. 7.3 days, $p < 0.001$). This is in line with previous research, which has consistently shown that ERAS pathways reduce hospital stays by 2 to 3 days, especially when combined with minimally invasive surgery. Our laparoscopic subgroup saw faster mobilization, less

pain, and better gastrointestinal recovery thanks to the synergy between ERAS principles and laparoscopic techniques [14]. Postoperative bowel recovery in our patients was encouraging, with a mean time to first bowel movement of 2.6 days. Patients undergoing laparoscopic surgery achieved bowel function earlier than those with open surgery, reflecting the physiological benefits of reduced surgical trauma [15]. This result mirrors previous reports that have shown enhanced gastrointestinal recovery as one of the most consistent outcomes of ERAS implementation. Early oral intake, achieved by 83.0% of patients within 24 hours, further reinforced these outcomes and highlights the safety of early feeding in colorectal surgery, countering traditional beliefs favoring delayed nutrition [16]. The comparative analysis of laparoscopic versus open surgery further underscored the added value of minimally invasive techniques in the ERAS setting. Patients undergoing laparoscopic procedures had significantly lower blood loss, quicker bowel recovery, and fewer complications compared to those treated with open surgery. While the readmission rates were not statistically different between groups, the overall trend favored laparoscopic procedures [17]. This suggests that ERAS may amplify the benefits of minimally invasive approaches, offering a dual advantage in modern colorectal care. Another important finding was the low readmission rate of 6.0%. This is reassuring, as one of the key concerns surrounding ERAS has been the possibility of premature discharge leading to higher readmission rates. Our findings demonstrate that ERAS's goal of reducing hospital stays does not compromise long-term safety. Patient satisfaction, although not formally quantified in this analysis, was qualitatively high, as most patients welcomed early mobilization, early feeding, and shorter hospitalization [18-20]. Despite these promising results, several challenges remain. Adherence to ERAS protocols is a critical determinant of success. Previous research has shown that compliance with at least 70% of ERAS elements is necessary to achieve optimal outcomes. While adherence in our institution was generally high, factors such as patient comorbidities, surgical complexity, and variations in staff training could influence outcomes [21]. Continuous education of the surgical team and reinforcement of standardized

pathways are therefore essential to sustain benefits. The strengths of this study include its prospective design, a relatively large sample size of 235 patients, and comprehensive evaluation of perioperative outcomes. However, certain limitations should be acknowledged. Being a single-center study, the results may not be generalizable to all institutions. Furthermore, we did not directly compare outcomes with a conventional care group, which would have provided a stronger measure of ERAS effectiveness. Lastly, patient-reported quality-of-life outcomes were not systematically assessed, representing an area for future research.

Conclusion

It is concluded that the implementation of Enhanced Recovery After Surgery (ERAS) protocols in patients undergoing elective colorectal surgery is both safe and effective. The adoption of ERAS was associated with earlier return of bowel function, reduced blood loss, shorter hospital stays, and a lower overall complication burden, without increasing readmission or mortality rates. The benefits were most pronounced in patients undergoing laparoscopic procedures, highlighting the synergistic effect of minimally invasive techniques combined with evidence-based perioperative care. .

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