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Research Article

Impact of Enhanced Recovery After Surgery (ERAS) Protocols on Postoperative Outcomes in Abdominal Surgeries

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Abstract: Abdominal surgeries are accompanied by high postoperative mortality and morbidity, and delayed recovery. Enhanced Recovery After Surgery (ERAS) is a multimodal approach that is designed to decrease surgical stress and enhance recovery results.
Objective: To compare outcomes of ERAS protocols with traditional care in patients undergoing abdominal surgical procedures. ***Methods***: A prospective comparative observational study was carried out on 140 patients who were electing to have abdominal surgeries. Patients were divided into an ERAS group (n=70) and a conventional group (n=70). Demographic data, perioperative and postoperative recovery data, complications, and readmission rates were evaluated. Independent t-test, Mann–Whitney U test, chi-square test, Fisher's exact test, and multivariable logistic regression were used in the statistical analysis. ***Results***: ERAS group patients had significantly shorter hospital stays, earlier oral feeding, earlier mobilization, lower pain scores, lower opioid needs, and higher patient satisfaction compared to the conventional group. Ventilation and extubation issues, as well as the need for early tracheostomy, were significantly lower in the ERAS group (p=0.006), as were all other variables. After multivariable analysis, ERAS implementation was associated with a decreased risk of postoperative complications (p=0.009). ***Conclusions***: ERAS protocols improved postoperative outcomes and the morbidity rate after abdominal surgery. Their integration into the standard surgical practice could enhance clinical results and healthcare effectiveness.

Keywords: S Enhanced Recovery After Surgery; abdominal surgery; postoperative complications; length of hospital stay; surgical outcomes.

INTRODUCTION

Abdominal surgery is a large proportion of surgical practice around the world and causes significant physiological stress, long recovery time, and high probability of postoperative complications.[1] It is estimated that over 300 million large surgical procedures are performed around the world each year, many of which are abdominal surgeries.[2] Although surgical procedures, anaesthetic and peri-operative management have improved over the years, postoperative morbidity continues to be a significant clinical problem, affecting increased costs of healthcare, longer hospital stays, delayed return to normal activities, and lower quality of life.[3] Abdominal surgery can still cause other common complications such as surgical site infection, postoperative ileus, nausea and vomiting, thromboembolic events, respiratory complications, and delayed nutritional recovery.[4]

The postoperative care of abdominal surgery has been traditionally delivered along the lines of classical care pathways, with a prolonged fast, delayed mobilization, the use of drains and tubes, opioid analgesics, and the progressive introduction of oral feeds.[5] Enhanced Recovery After Surgery (ERAS) protocols have been developed because it is recognised that evidence-based, multidisciplinary approaches are needed to optimise perioperative care.[6]

ERAS is a multimodal patient-centred approach, involving evidence-based interventions across the preoperative, intraoperative and postoperative phases of surgical care.[7] They involve counselling before surgery, optimizing nutritional status, avoiding prolonged fasting, carbohydrate loading (if applicable), using a minimally invasive surgical technique, opioid-sparing analgesics, goal-directed fluid therapy, preventing postoperative nausea and vomiting, early mobilization, and early oral feeding.[8] The key goal of ERAS is to mitigate the impact of surgery, preserve

normal function, and shorten recovery time, thereby minimizing complications and the use of health resources.[9]

Although generally known and well documented, the implementation and success of ERAS protocols have been variable across healthcare systems, with differences in institutional resources, multidisciplinary collaboration, patient characteristics and compliance with protocol elements. The use of ERAS in many developing countries, such as Pakistan, is still limited, and the evidence evaluating its effect on postoperative outcomes for diverse populations of patients undergoing abdominal surgery is continuing to evolve. Local data is needed to understand the feasibility of implementing ERAS pathways in regular clinical practice and to confirm that they generate similar benefits in limited resource areas. Thus, the assessment of the effect of ERAS protocols in abdominal surgery is essential to determine their contribution in enhancing surgical recovery, minimizing postoperative morbidity and optimizing the delivery of health care. The present study aimed to evaluate the impact of ERAS protocols on postoperative outcomes in patients who underwent abdominal surgical procedures.

Materials and Methods

A prospective comparative observational study was carried out at the Department of Surgery, Sheikh Zayed Medical College and Hospital, Rahim Yar khan, The study was conducted over a period of six months, from 1st July, 2025 to 31st December, 2025.

The sample size was determined using OpenEpi version 3.01 for comparing two independent proportions. This calculation was based on a previous study by Ljungqvist et al, 2017, which found that postoperative complications were reduced from 30% in the standard care groups in the perioperative period to around 15% in patients managed in ERAS groups.[10] The sample size, based on a 1:1 allocation, 95% confidence level and 80% study power, was determined to be 140 patients (70 patients for each group: ERAS and conventional care).

A non-probability consecutive sampling technique was used for patient selection. Patients were randomly selected and consecutively enrolled from all patients who were eligible for abdominal surgical procedures during the study period. Patients were divided into two groups: ERAS group and conventional perioperative care group. Patients were allocated depending on the perioperative pathway they went through during the study period in the institution.

Patients who were 18 years old or older and had undergone elective abdominal surgery, such as colorectal surgery, gastric surgery, hepatobiliary surgery, and other major abdominal surgery, were eligible for the study. The inclusion criteria were that the patient had to give informed consent and had to participate in the postoperative follow-up. Patients undergoing emergency abdominal surgery, patients who needed to be re-explored, patients with severe uncontrolled systemic illness, patients with pre-existing organ failure, patients who could not follow the postoperative mobilisation and feeding protocol, and patients with incomplete clinical record were excluded from the study.

Demographic and clinical data were gathered after obtaining ethical approval and informed consent by the use of a structured data collection proforma. Baseline data about age, gender, BMI, comorbidities, and abdominal surgical procedures were taken. Demographic data such as age, gender, BMI, comorbidities, type of abdominal surgery, and operative details were documented. Predefined ERAS components (preoperative counselling, optimisation of nutrition, fasting duration, multimodal analgesia, intraoperative fluid management, early mobilisation, early oral intake and removal of tubes and drains when clinically possible) were documented for patients managed along the ERAS pathway.

The postoperative outcomes were evaluated in ERAS and conventional care groups. The outcomes focused on were length of postoperative hospital stay, time to first oral intake, time to ambulation, postoperative pain scores, and postoperative complications. Secondary outcomes were frequency of postoperative nausea and vomiting, surgical site infection, postoperative ileus, readmission in the first 30 days, and overall satisfaction. Patients' clinical records and direct examination were used to collect data throughout the hospital stay and at follow-up visits.

IBM SPSS Statistics version 26 was used for analyzing the data. Data were presented as mean ± standard deviation, median (interquartile range), and as frequencies and percentages as appropriate for the data, depending on how they were distributed. The normality of continuous variables was determined using the Shapiro–Wilk test. For comparison between ERAS and conventional care groups of continuous variables, an independent-samples t-test and Mann–Whitney U test were used. The Chi-square or Fisher's exact test was used to compare categorical variables. Multiple logistic regression analysis was conducted to determine factors that were independently associated with decreased postoperative complications and shorter hospital stays. Odds ratios (ORs) were adjusted for 95% confidence intervals (CIs). A significance level of p-value ≤ 0.05 was used.

RESULTS

A total of 140 patients undergoing elective abdominal surgeries were included in the study, with 70 patients allocated to the ERAS group and 70 to the conventional care group. The clinical and demographic data of both groups were similar at baseline. The mean age was 48.6±13.2 years in the ERAS group and 50.1±12.8 years in the conventional group (p=0.487). Likewise, no significant differences were noted in terms of gender distribution, BMI, or comorbid conditions (diabetes mellitus, hypertension, and ischemic heart disease) at baseline, which allowed for good comparability of groups (Table 1). The distribution of abdominal surgical procedures was similar between the two groups. The most common surgeries were colorectal procedures, which accounted for 40.0% of surgeries performed in the ERAS group and 37.1% in the conventional group, followed by hepatobiliary, gastric, and other abdominal surgeries. There was no statistically significant difference between the type of surgical procedures performed in the two groups (p=0.732), indicating that the surgical characteristics were the same and unlikely to affect any difference in outcome (Table 2).

The ERAS pathway group exhibited significantly greater adherence to important peri-operative recovery factors than the conventional pathway group. The following were significantly more common among ERAS patients (all p<0.001): preoperative counselling, avoidance of prolonged fasting, opioid-sparing analgesia (opioids in the immediate postoperative period, but not used for the majority of the postoperative period), early oral feeding, early mobilization and timely removal of urinary catheters or drains. The results in the intervention group were consistent with successful implementation of ERAS-based perioperative strategies (Table 3).

Patients who received ERAS care had significant improvements in postoperative recovery parameters. The ERAS group started oral feeding and ambulation earlier than those in the conventional care group. In addition, the ERAS group experienced a significantly shorter length of hospital stay after surgery compared to the non-ERAS group (p<0.001). Patients in the ERAS group also had lower pain scores, fewer times they needed rescue opioids, and higher level of satisfaction scores compared to the conventional group (Table 4).

Overall, the incidence of postoperative complications was significantly lower in patients who underwent ERAS protocols than in patients who underwent conventional care (p=0.006). Surgical site infection, respiratory complications, and 30-day readmission rates showed no significant differences between the ERAS and non-ERAS groups. ERAS patients had significantly lower rates of postoperative ileus and nausea or vomiting. These results revealed that ERAS implementation led to decreased postoperative morbidity after abdominal surgery (Table 5).

Multivariable logistic regression analysis showed that the implementation of the ERAS protocol was independently associated with reduced risk of postoperative complications. Compared with the conventional approach, there were significantly lower odds of developing postoperative complications in patients managed in ERAS pathways (p=0.009). However, after adjustment, only early mobilization remained statistically significant with a reduced risk of postoperative complications (p=0.044), while older age, diabetes, obesity, and major abdominal procedures were not statistically significant predictors (Table 6).

Table 1: Demographic and Baseline Clinical Characteristics of Study Participants (n=140)

Variables	ERAS Group (n=70)	Conventional Group (n=70)	p-value
Mean age (years)	48.6 ± 13.2	50.1 ± 12.8	0.487
Age ≥60 years	18 (25.7%)	21 (30.0%)	0.578
Male gender	42 (60.0%)	39 (55.7%)	0.612
Female gender	28 (40.0%)	31 (44.3%)	
Mean BMI (kg/m²)	26.1 ± 3.8	26.5 ± 4.1	0.543
BMI ≥30 kg/m²	12 (17.1%)	14 (20.0%)	0.655
Diabetes mellitus	15 (21.4%)	17 (24.3%)	0.681
Hypertension	20 (28.6%)	22 (31.4%)	0.722
Ischemic heart disease	5 (7.1%)	6 (8.6%)	0.754

Table 2: Distribution of Types of Abdominal Surgical Procedures

Type of Surgery	ERAS Group (n=70)	Conventional Group (n=70)	p-value
Colorectal surgery	28 (40.0%)	26 (37.1%)	0.732
Gastric surgery	12 (17.1%)	14 (20.0%)	
Hepatobiliary surgery	15 (21.4%)	13 (18.6%)	
Hernia/other abdominal procedures	15 (21.4%)	17 (24.3%)	

Table 3: Comparison of ERAS Protocol Compliance Components Between Groups

ERAS Components	ERAS Group (n=70)	Conventional Group (n=70)	p-value

Preoperative counselling	70 (100%)	42 (60.0%)	<0.001
Avoidance of prolonged fasting	64 (91.4%)	18 (25.7%)	<0.001
Multimodal opioid-sparing analgesia	65 (92.9%)	24 (34.3%)	<0.001
Early oral feeding within 24 hours	62 (88.6%)	15 (21.4%)	<0.001
Early mobilisation within 24 hours	60 (85.7%)	20 (28.6%)	<0.001
Early removal of urinary catheter/drains	58 (82.9%)	23 (32.9%)	<0.001

Table 4: Comparison of Postoperative Recovery Outcomes Between ERAS and Conventional Groups

Postoperative Outcome	ERAS Group (n=70)	Conventional Group (n=70)	p-value
Time to first oral intake (hours)	18.4 ± 6.2	42.7 ± 12.5	<0.001
Time to first ambulation (hours)	20.6 ± 7.4	45.3 ± 14.1	<0.001
Postoperative hospital stay (days)	4.2 ± 1.5	7.1 ± 2.4	<0.001
Mean pain score (VAS at 24 hours)	3.2 ± 1.1	5.8 ± 1.4	<0.001
Requirement of rescue opioids	18 (25.7%)	45 (64.3%)	<0.001
Patient satisfaction score	8.4 ± 1.2	6.5 ± 1.5	<0.001

Table 5: Comparison of Postoperative Complications Between Study Groups

Postoperative Complication	ERAS Group (n=70)	Conventional Group (n=70)	p-value
Overall complications	12 (17.1%)	27 (38.6%)	0.006
Surgical site infection	5 (7.1%)	10 (14.3%)	0.180
Postoperative ileus	4 (5.7%)	12 (17.1%)	0.035
Nausea and vomiting	8 (11.4%)	20 (28.6%)	0.011
Respiratory complications	3 (4.3%)	8 (11.4%)	0.112
30-day readmission	4 (5.7%)	6 (8.6%)	0.510

Table 6: Multivariable Logistic Regression Analysis for Factors Associated with Reduced Postoperative Complications

Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
ERAS protocol implementation	0.38	0.18–0.79	0.009
Age ≥60 years	1.42	0.71–2.83	0.318
Diabetes mellitus	1.56	0.72–3.38	0.257
BMI ≥30 kg/m²	1.31	0.58–2.95	0.512
Major abdominal surgery	1.87	0.91–3.82	0.087
Early mobilisation	0.46	0.21–0.98	0.044

DISCUSSION

In the present study, the effect of ERAS protocols on postoperative results of abdominal surgeries was assessed. The results showed that recovery parameters such as time to oral intake, time to ambulation, reduced postoperative pain and opioid consumption, time to hospital discharge, reduced complications, and patient satisfaction were significantly better when ERAS pathways were used. In addition, structured perioperative care pathways for abdominal surgery were confirmed to be an independent factor in reducing the risk of postoperative complications, as demonstrated by the results of the multivariable analysis.

Patients treated with ERAS protocols had a significantly shorter hospital stay than the conventional treatment group. These results were corroborated by a meta-analysis of colorectal surgery patients, who reported a pooled standardized mean difference (SMD) of −1.22 days for ERAS interventions versus traditional practice. The improvement was attributed by the authors to a coordinated improvement in treatment that involved early feeding, early mobilization and optimised pain management.[11] Similarly, a comprehensive study showed that ERAS shortened the hospital stays by nearly 1.88 days compared to the standard peri-operative care. The comparable decrease we found suggests that ERAS protocols are feasible and effective even in a tertiary care setting.[12]

Early restoration of gastrointestinal function and mobilization are key components of ERAS pathways. In our study, early oral feeding and ambulation were achieved in the ERAS group while the conventional care group failed to achieve the same. The results are similar to the study, which indicated that ERAS achieved a significant recovery of bowel function, such as earlier flatus and oral diet tolerance in colorectal surgery patients.[13] In other studies, Niu et al. (2023) showed that ERAS procedures in minimally invasive colorectal cancer surgery accelerated recovery of the gastrointestinal system and allowed for earlier discharge, resulting in better functional outcomes. The better functional recovery we can demonstrate with our study

might be attributed to the avoidance of prolonged fasting, early nutritional support, and lower physiological stress with ERAS-based management.[14]

Post-operative pain management is an important factor in recovery following abdominal surgery. We found that the pain scores were significantly lower and the quantity of required rescue opioid was less for ERAS patients. This is confirmed by Echeverria et al. (2020), who found that the use of multimodal pain management techniques within ERAS pathways was associated with a significant decrease in opioid consumption without any deterioration in pain management.[15] ERAS protocols focus on non-opioid analgesics, regional anesthesia techniques, and early mobilization, which could be part of the reason why that patient is better prepared for their comfort and recovery.

The present study observed a significant reduction in overall postoperative complications among ERAS patients. In a study, ERAS was found to significantly reduce the number of postoperative complications in colorectal surgery patients.[16] Moreover, the randomized trial meta-analysis showed that complication rates were significantly lower with ERAS pathways (pooled risk ratio 0.71), when compared with conventional pathways. This lower rate of complication in our study may be due to better peri-operative optimization, early mobilization, better respiratory function and a lower incidence of postoperative ileus.[12]

Postoperative ileus is a frequent complication after abdominal surgery, and is an important factor for the extended hospital stay. Postoperative ileus was less common in the ERAS group when compared to conventional care in the current study. Similarly, Greco et al. (2021) reported a decreased rate of gastrointestinal complications with ERAS protocols, including early feeding and reducing fluid input, and minimizing opioid usage. Moreover, the decrease in ileus that we saw in our study provides further evidence to the potential of ERAS to help maintain the physiological state of recovery after abdominal surgery.

The positive impact of ERAS has been continuously demonstrated over the past few years (2021-2026) in various abdominal surgical populations. In hepatobiliary surgery, Melloul et al. (2022) found that ERAS implementation led to better recovery and lower healthcare resource use, and, in colorectal surgery, showed that ERAS protocols resulted in better short-term outcomes and cost savings.[17] In addition, new studies indicate that the effectiveness of ERAS is not only the availability of ERAS protocols but also institutional buy-in, multi-disciplinary teamwork and compliance with the individual pathway components.[18]

Overall, the results of the present study are consistent with newer international studies showing that ERAS has a positive impact on postoperative recovery after abdominal surgery. The hospital stay, complications, pain scores and opioid use reductions observed provide evidence of the potential of ERAS pathways to be a successful approach for optimizing surgical outcomes. Structured implementation of ERAS protocols might be a useful strategy in resource-poor healthcare systems where hospital capacity and costs of healthcare are still a problem, and the quality of perioperative care can be enhanced without compromising patient safety. Further multi-centre studies with larger numbers of patients are recommended to assess the long-term outcomes, cost effectiveness and sustainability of ERAS implementation in various surgical environments.

There were limitations in the present study. First, the study was performed in a single tertiary care centre and there were a small number of participants, which might limit the generalisability of the results to other health care settings. Secondly, the non-randomised design might have caused selection bias and possible confounding factors, even after adjusting with multivariable analysis. Third, the techniques for surgery and the individual patient characteristics could have affected the results after the surgery. The evaluation of ERAS compliance relied on institutional practice and the ability to control for any differences in compliance with each portion of the protocol was limited. Also, long-term outcomes such as quality of life, functional status at discharge and cost-effectiveness were not assessed. Future multicentre randomized trials with larger numbers and longer follow-up are recommended to further validate the effectiveness and sustainability of ERAS pathways.

CONCLUSION

ERAS protocols significantly improved postoperative outcomes among patients undergoing abdominal surgeries. ERAS implementation was associated with shorter hospital stay, earlier return of gastrointestinal function, reduced postoperative pain, lower opioid requirements, and decreased postoperative complications. The results align with the integrated multidisciplinary ERAS pathways in their belief that these pathways should be implemented in routine surgical practice to help improve recovery and optimize the use of resources while enhancing patient-centred care.

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