



Evaluating the Impact of Enhanced Recovery After Surgery (ERAS) Protocols on Postoperative Morbidity and Hospital Stay

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ABSTRACT

Background: Enhanced Recovery after Surgery (ERAS) protocols are the scientifically-supported perioperative guidelines aimed at optimizing the recovery, minimizing the complications, as well as the hospitalization. The objective of this study was to determine the impact of ERAS measures on postoperative outcome, such as complications, hospital stay, pain management, and functional recovery, in comparison to the traditional methods of perioperative care.

Methods: This prospective cohort study (September 2023 to February 2024) included 140 adult patients undergoing general surgical practice was recruited with 70 of the population treated according to an ERAS protocol and 70 treated according to conventional care. Demographic and clinical baseline data were taken. Postoperative complications, hospital stay, and pain scores, ambulation time, postoperative site infections,

and postoperative nausea and vomiting, as well as 30-day readmission, were recorded. T-tests were used to analyze the continuous variables and chi-square to test the categorical variables, $p < 0.05$ was considered significant.

Results: The 13 (18%) patients in the ERAS group had much fewer postoperative problems ($p=0.012$) and shorter hospitalization (3.8 ± 1.2) compared to the Standard Care group (6.2 ± 1.5). The pain scores at 24 and 48 hours were lower, and the ambulation was earlier in the ERAS group ($p<0.001$). Postoperative nausea/vomiting and 30-day readmission rates were also equal, and surgical site infections (SSI) were less frequent as 4(5.7%, $p=0.04$).

Conclusion: ERAS protocols are effective in general surgical patients by decreasing complications, length of stay, pain management, and mobilization in both general and surgical patients

Keywords: Enhanced Recovery After Surgery (ERAS), General Surgery, Postoperative Complications, Hospital Stay, Postoperative Recovery, Pain Management, Early Mobilization

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INTRODUCTION

Although surgical operations are life-saving in many cases, they expose patients and healthcare systems to serious physiological stress, which may lead to postoperative complications, delayed recovery, and long hospitalization ¹. Traditional approaches to perioperative care have mostly focused on surgery care, often ignoring the holistic parameters of recovery, including early mobilization, multimodal analgesia, and optimal nutritional care ². Enhanced Recovery After Surgery (ERAS) procedures are evidence-based and multimodal models of perioperative processes that are designed to enhance the outcome of surgery ³. The elements such as preoperative counseling, carbohydrate loading, opioid-sparing analgesia, early mobilization, and goal-directed fluid therapy are aimed at reducing surgical stress and shortening the recovery ⁴. Researchers have reported that ERAS can reduce the systemic inflammation, reduce the hospital stay and also increase patient satisfaction in certain types of surgical patients ⁵.

Although the support of ERAS in colorectal, orthopedic, and oncological surgeries is increasing, the efficacy of this method in heterogeneous general surgeries is insufficiently explored ⁶. The previous researches are limited to procedure-specific effect, and it cannot be generalized to a larger general surgery environment ⁷. Furthermore, there is scarce information on prospective single-center cohorts assessing both postoperative morbidity and hospital stay as a primary outcome under uniform ERAS guidelines ⁸. The differences in protocol compliance, patient factors, and institutional capacity in support lead to the continuing gap in the literature, which highlights the importance of intensive assessment of ERAS in general surgical groups ⁹.

The purpose of this study was to determine the effect of the ERAS protocols on postoperative morbidity and length of stay in general surgery patients versus conventional perioperative care in order to assess whether structured implementation of ERAS protocols has a positive effect on early surgical recovery

METHODS

This is a prospective single-center based cohort study (September 2023 to February 2024), was conducted at General Surgery Department ASTH, JHL Lahore (3850/23/ASTH) after informed consents. The research followed the principles of the Declaration of Helsinki. The main study objectives were a postoperative morbidity, defined as any complication that happens within 30 days of surgery, and length of hospital stay in days. It also assessed the pain scores after 24 hours and 48 hours, time of ambulation in hours, surgical site infection incidence, postoperative nausea and vomiting, and the 30 days readmission rate.

The sample size was calculated using OpenEpi version 3.0.0 (Atlanta, GA, USA), considering 95 % confidence, power of 80 % and Margin of error of 5 %¹⁰, and using the difference in postoperative morbidity that was expected between the ERAS and conventional care groups. A total of 140 participants were employed in the study through a non-probability consecutive sampling method with 70 patients in each group.

The inclusion criteria were the presence of adult patients aged 18 years and above who have undergone general surgical procedures under anesthesia, irrespective of the specific type of surgery. Exclusion criteria included patients with American Society of Anesthesiologists (ASA) physical status of IV or above, traumatized patients, pregnant women, direct postoperative ICU admission, and incompetence to give informed consent. Preoperative evaluation of all respondents with reference to detailed medical history and baseline laboratory investigations were conducted to facilitate standardization.

The participants were divided into two groups in accordance with the perioperative care pathway. There were a total of 140 patients with 70 patients in the ERAS group and 70 patients in the standard care group. ERAS patients received a structured ERAS protocol that incorporated preoperative counseling, carbohydrate loading, multimodal opioid-sparing analgesia, early postoperative feeding, goal-directed fluid therapy, and early mobilization. The traditional perioperative management without an organized ERAS protocol was provided to the Standard Care group. There was no randomization or blinding, but both groups were similar regarding baseline demographics and operative procedures.

The data was collected prospectively by clinical examination, operative records and postoperative monitoring. The Visual Analog Scale (VAS) was used to measure pain at 24 and 48 hours after surgery. Time to ambulation, surgical site infection, postoperative nausea and vomiting, length of hospital stay, and readmission within 30 days was recorded.

All data were evaluated through SPSS version 26 (IBM Corp., Armonk, NY, USA). Continuous variables were reported in mean and standard deviation and compared by the means of independent t-test or Mann Whitney U test. Categorical variables were measured in the form of frequency and percentage and evaluated with chi-square or Fisher exact test. A p-value of less than 0.05 was assumed to be statistically significant.

RESULTS

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

Variable	ERAS (n=70)	Standard Care (n=70)	p-value
Age (years, mean \pm SD)	46.2 \pm 12.4	47.8 \pm 13.1	0.42
Male, n (%)	38 (54.2)	40 (57.1)	0.72
Elective surgery, n (%)	50 (71.4)	48 (68.6)	0.69
Emergency surgery, n (%)	20 (28.6)	22 (31.4)	0.69

SD = Standard Deviation; χ^2 = Chi-square test. Independent t-test and chi-square test was used.

The study involved 140 patients with 70 patients in the ERAS group and 70 patients in the Standard Care group. The average age of the participants was 46.2 \pm 12.4 in the ERAS group and 47.8 \pm 13.1 in the Standard Care group. The ERAS group and the Standard Care group included 38 (54.2%) and 40 (57.1%) male patients, respectively. Elective and emergency surgeries were equal in the two groups ($p > 0.05$), which demonstrated similar baseline features.

Table 2: Postoperative Complications and Hospital Stay

Variable	ERAS (n=70)	Standard Care (n=70)	p-value
Postoperative complications, n (%)	13 (18.5)	26 (37.1)	0.012*
Length of hospital stay (days, mean \pm SD)	3.8 \pm 1.2	6.2 \pm 1.5	<0.001 *

SD = Standard Deviation, Independent t-test and Chi-square test was used, Statistically significant $p < 0.05$.

The two groups were similar in demographic and type of surgical procedures at baseline. About 13 (18.5%) patients treated according to the ERAS protocol had much fewer postoperative complications than the Standard Care group as in 26 patients (37.1%, $p = 0.012$). Moreover, duration of stay in the hospital was much less in the ERAS group with the mean of 3.8 \pm 1.2 days compared to the Standard Care group of 6.2 \pm 1.5 days ($p < 0.001$). Table 2 presents the postoperative complications and hospital stay. The implementation of ERAS was closely linked to the decrease in the number of postoperative complications and the length of stay in the hospital.

ERAS group had a much lower score of pain at 24 hours (3.1 ± 1.0 , $p < 0.001$) and 48 hours (2.0 ± 0.9 , $p < 0.001$) than the Standard Care. Patients of the ERAS group walked sooner (11.3 ± 3.1 vs. 22.6 ± 5.2 hours, $p < 0.001$) and had fewer surgical site infections as in 4 (5.7%) compared to standard care in 11 patients (15.7, $p = 0.04$). There were no significant differences in postoperative nausea/vomiting ($n = 8$ (11.4%) compared to $n = 12$ (17.1%), $p = 0.36$) or readmission in 30 days ($n = 3$ (4.2%) compared to $n = 6$ (8.5%) $p = 0.28$). Table 3 shows the postoperative recovery parameters.

Table 3: Postoperative Recovery Parameters

Parameter	ERAS (n=70)	Standard Care (n=70)	p-value
Pain score 24h (VAS, mean \pm SD)	3.1 ± 1.0	5.2 ± 1.4	<0.001
Pain score 48h (VAS, mean \pm SD)	2.0 ± 0.9	4.1 ± 1.2	<0.001
Time to ambulation (hrs, mean \pm SD)	11.3 ± 3.1	22.6 ± 5.2	<0.001
Surgical site infection, n (%)	4 (5.7)	11 (15.7)	0.04
Postoperative nausea/vomiting, n (%)	8 (11.4)	12 (17.1)	0.36
30-day readmission, n (%)	3 (4.2)	6 (8.5)	0.28

*SD = Standard Deviation, Chi-square test and independent t-test was used, VAS = Visual Analog Scale, Statistically significant, $p < 0.05$.

Patients with ERAS had a quicker healing rate, less pain, earlier mobilization and fewer surgical site infections, whereas nausea, vomiting, and readmission were equivalent across the groups.

DISCUSSION

This prospective, single-center trial which involved 140 general surgery patients showed that the use of Enhanced Recovery after Surgery (ERAS) protocols resulted in substantial postoperative recovery. The ERAS group patients had fewer postoperative complications, shorter stay, lower pain levels, earlier mobilization and earlier use of oral intake than the perioperative conventional care patients. Surgical site infection rates were also lower, and the proportions of postoperative nausea, vomiting, and 30-day readmissions were comparable across the groups, suggesting that the enhanced recovery did not affect the safety and patient outcomes. These results indicate the general effectiveness of the structured ERAS pathways in general surgery practice.

The decrease in the number of postoperative complications in the ERAS group is consistent with the existing evidence showing the effectiveness of multimodal perioperative pathways¹¹. It has been

demonstrated in earlier literature that the structured ERAS programs reduce stress levels before and after surgery, maximize analgesia, improve immune functioning, and suppress systemic immune responses, which all decrease the rate of complication¹². In particular, the protocols that focus on early mobilization, goal-directed fluid therapy, multimodal opioid-sparing analgesia, and close perioperative monitoring have been repeatedly linked to the low incidence of wound complications, lower pulmonary and cardiovascular complications, and lower postoperative ileus^{13,14}. We find that ERAS contributes to physiological resilience and prompt recovery during the immediate postoperative setting, which is consistent with the outcomes of previous studies in both elective and emergency surgical groups¹⁵.

Another significant finding in this study was the reduced hospital stay. The patients under the ERAS were discharged a lot earlier than the ones under traditional care, which demonstrated a faster functional recovery and less reliance on hospital resources^{16,17}. Similarly, shortened hospitalization were also previously documented and attributed to the effect of optimized perioperative nutrition, early mobilization and standardized care pathways, multimodal analgesia and proactive engagement with patients^{18,19}. Structured ERAS protocols and decreased length of stay by 30-50 % with no impact on readmission rates or postoperative complications were found in a few multicenter audits²⁰. Our findings contribute to the fact that ERAS can be safely used to shorten the duration of stay with high standards of postoperative care, with a focus on efficiency and patient-centered outcomes.

These results have great clinical implications. Fewer postoperative complications and less time in hospital also enhance patient outcomes, lower healthcare costs, and also optimize the use of hospital resources^{21,22}. Mechanistically, the ERAS protocols can reduce systemic inflammatory responses, maintain the organ functions, and enhance the pain management, and thus, enable faster physiological recovery. A combination of early nutrition, mobilization, and standardized perioperative procedures, is most likely to lead to better wound healing, gastrointestinal activity, and overall well-being of the patient^{23,24}. Additionally, a better patient engagement by preoperative counseling and education results in a better patient compliance to postoperative instructions and encourages recovery further²⁵.

There are a number of limitations to this study. Since it is a single-centered study and has a very small sample, the generalizability of results might be limited. No randomization and blinding were conducted and this may lead to selection bias. Also, the functional recovery, patient-reported satisfaction after discharge, and quality of life in the long term outcomes were not examined. Future studies must be directed to multicenter studies that use larger samples, follow up studies, and cost effectiveness studies to study the effects of ERAS protocols in different surgical environments. Moreover, the impact of protocol adherence and perioperative optimization on various surgical subgroups may be studied in the future to determine which factors can optimally increase the benefits of ERAS pathways.

CONCLUSION

The use of Enhanced Recovery After Surgery (ERAS) protocols in general surgical patients resulted in significant improvement of the postoperative recovery. ERAS was linked to reduced complications, a shorter hospitalization, low pain index, earlier mobilization, and reduced surgical site infections than the traditional perioperative care. These results suggest that multimodal, well-structured perioperative pathways are more helpful in improving physiological resilience and speeding up functional recovery without negatively affecting patient safety. The applicability of ERAS to a wide variety of surgical interventions is demonstrated by the reproducibility of benefit. ERAS protocols can be adopted to optimize patient outcomes, decrease medical expenses, and increase hospital efficiency, which contributes to its acceptance as a standard practice in general surgery.

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None.

CONFLICT OF INTEREST

None.

ETHICAL APPROVAL

This is a prospective single-center based cohort study (2023 to February 2024), was conducted at General Surgery Department ASTH, JHL Lahore (3850/23/ASTH).

AUTHORS' CONTRIBUTION

All authors contributed equally as per ICMJE.

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