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ORIGINAL ARTICLE

Enhancing Recovery in Gastrointestinal and Cardiovascular Surgeries through ERAS Protocols

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ABSTRACT

Background: Enhanced Recovery After Surgery (ERAS) protocols are evidence-based, multimodal perioperative care pathways designed to reduce surgical stress, accelerate recovery, and improve clinical outcomes. While ERAS has been widely implemented in gastrointestinal surgery, its application in cardiovascular surgery remains limited, particularly in resource-constrained healthcare settings.

Objective: To evaluate the effectiveness of ERAS protocols in improving postoperative recovery outcomes among patients undergoing gastrointestinal and cardiovascular surgeries at tertiary care hospitals.

Methods: This multicenter prospective observational study included 120 adult patients undergoing elective gastrointestinal and cardiovascular surgeries at THQ Hospital, Ali Pur, Muzaffargarh, and Services Hospital, Lahore, from June 2022 to April 2023. Patients were managed either under ERAS-based perioperative care or conventional perioperative protocols. Data were collected on demographic characteristics, recovery milestones, postoperative complications, length of hospital stay, opioid consumption, and readmission rates. Statistical analysis was performed using SPSS version 26, with a p-value of <0.05 considered statistically significant.

Results: Patients managed with ERAS protocols demonstrated significantly earlier initiation of oral intake and mobilization compared with conventional care ($p < 0.001$). The ERAS group showed a lower overall postoperative complication rate (18.3% vs. 36.7%, $p = 0.03$), reduced duration of mechanical ventilation and intensive care unit stay in cardiovascular surgery patients, and a significantly shorter mean hospital stay (5.6 ± 1.9 days vs. 8.9 ± 2.7 days, $p < 0.001$). Opioid requirements were significantly reduced in the ERAS group, with no significant difference in 30-day readmission rates. These benefits were observed consistently across both male and female patients.

Conclusion: Implementation of ERAS protocols significantly enhances postoperative recovery in gastrointestinal and cardiovascular surgeries by reducing complications, shortening hospital stay, and promoting early functional recovery without compromising patient safety. Adoption of ERAS pathways in tertiary care hospitals may improve surgical outcomes and optimize healthcare resource utilization.

Keywords: Enhanced Recovery After Surgery, ERAS, Gastrointestinal Surgery, Cardiovascular Surgery, Perioperative Care, Postoperative Outcomes.

INTRODUCTION

Gastrointestinal and cardiovascular major surgical operations are linked to a high physiological burden, postoperative morbidity, and extended duration of hospital hospitalization coupled with high healthcare expenditures[1]. Although major advances have been made in surgery and perioperative monitoring, customary perioperative care streams have been dependent on such customary practices as long-term preoperative starvation, generous fluid administration, frequent drain and tube use, latent mobilization and opioid-driven analgesia. These traditional methods can unintentionally increase the stress response to surgery, resulting in insulin resistance, immune dysfunction, slowed recovery in the organ and the development of more post-operative complications[2,3].

ERA was formulated to deal with these limitations as a structured, evidence-based, and multidisciplinary model of perioperative care[4]. ERAS guidelines focus on the reduction of the physiological stress of surgery, maintenance of normal body activity and fast recovery after surgery by combining optimized preoperative preparation, minimally invasive surgery, individualized strategies of anesthesia, early nutrition and early mobilization. Originally utilized in colorectal surgery, ERAS has over time been implemented in a variety of surgical specialties because it has been shown to achieve better patient outcomes and shorter hospitalization[5,6].

Gastrointestinal and cardiovascular surgeries are two risky areas of surgery where metabolic disturbances and inflammatory reactions alongside cardiopulmonary compromise is often complicating the postoperative recovery. Postoperative ileus, infection, and delayed bowel functioning are still important causes of extended hospital stay in gastrointestinal surgery[7]. Likewise, respiratory complications, long-term mechanical ventilation, atrial arrhythmias, fluid imbalance, and long hospitalization in the intensive care unit are directly related to cardiovascular surgery. Such complications may be reduced through the application of ERAS principles in such settings in a systematic methodology that ensures the safety of the patients[8,9].

Recent data have suggested that ERAS use in gastrointestinal surgery leads to a decrease in postoperative morbidity, earlier gut function recovery, a decrease in opioid needs, and patient satisfaction. ERAS-based pathways (also called fast-track or enhanced recovery cardiac surgery) have shown improvement in cardiovascular surgery, such as reduction in the duration of ventilation, quicker mobilization, less intensive care unit dependency and a reduction in healthcare costs. These results underscore the versatility and usefulness of ERAS guidelines in a wide range of surgical patients [10,11].

Although there is an increasing acceptance of ERAS protocols in surgery, their implementation in gastrointestinal and cardiovascular surgery is not consistent and varies especially in healthcare systems of low and middle income. Issues like scarcity of resources, the absence of standard institutional practices and traditional practice remain a barrier to the widespread implementation. Thus, the optimal perioperative care is based on the in-depth study of the ERAS principles, clinical outcomes, and implementation strategies[12].

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The present study represents a detailed discussion of the ERAS guidelines in gastrointestinal and cardiovascular surgeries, their physiological basis, key elements, clinical advantages, and difficulties with implementation. This review brings forth the importance of ERAS in the synthesis of the existing evidence as an innovative model of enhancing surgical recovery and patient-centered care[13].

MATERIALS AND METHODS

The current prospective observational study in a hospital environment was developed to determine the efficacy of Enhanced Recovery After Surgery (ERAS) interventions to enhance the outcomes of postoperative recovery in patients who underwent major gastrointestinal and cardiovascular surgeries. The research was conducted at THQ Hospital, Ali Pur, Muzaffargarh, and Services Hospital, Lahore, during a study period of between June, 2022 and April 2023.

Consecutive sampling was used to enroll 120 patients. The patients aged between 18 and 75 years who were scheduled to undergo elective gastrointestinal surgery including colorectal, gastric, hepatobiliary, and pancreatic surgery, and elective cardiovascular surgery such as coronary artery bypass grafting and valve replacement were included in the study. Patients who had an American Society of Anesthesiologists (ASA) physical status of I to III were only qualified. All participants were recruited by informed consent, which was written. They did not include patients who had emergency surgeries or patients with ASA physical status IV or V, patients with active malignancy and subjected to chemotherapy, and those that were not able to comply with the elements of ERAS or incomplete perioperative data.

The participants were handled either using an ERAS-oriented perioperative care pathway or the traditional perioperative management on the basis of clinical feasibility and institutional practice. ERAS program included the coordinated interventions during the preoperative, intraoperative, and postoperative stages. Patients were preoperatively advised in detail about the surgical procedure and anticipated recovery, shorter fasting times with clear fluid up to two hours before anaesthesia, carbohydrate loading in cases when it was clinically appropriate and comorbid conditions, including anemia, diabetes mellitus, and hypertension, optimized. The smoking cessation advice and respiratory physiotherapy was also given when necessary.

During surgery, it was focused on minimally invasive surgical procedures where possible, multimodal and opioid-sparing analgesia, normothermia, prevention of postoperative nausea and vomiting, and goal-oriented fluid therapy to avoid hypovolemia and fluid overload. To reduce the stress in surgery and promote early postoperative recovery, standardized methods of anesthesia were used.

The patients were encouraged to take oral food as they can and they were mobilized within the first 24 hours after the surgery. The premature removal of urinal catheters, surgery drains, and intravenous lines was being done as per clinical judgment. Multimodal analgesia and reduced opioid consumption pain management were applied, and the prophylaxis of venous thromboembolism was performed on the basis of personal risk evaluation. Recovery milestones were recorded daily to determine the progress and discharge readiness.

The structured proforma was used to collect data collected by trained research staff. The baseline variables were age, sex, body mass index, comorbidities, and ASA status, and type of surgery. The intraoperative variables included the period of the operation, blood loss, fluid, and transfusion requirements. The outcome measures were time to first oral intake, time to ambulation, the duration of mechanical ventilation and intensive care unit stay among cardiovascular surgery patients, postoperative pain scale, opioid use, complications, and the overall hospital stay. In the case of available recordings, thirty-day readmission data were recorded.

The SPSS version 26 was used to conduct statistical analysis. The continuous variables were in the form of M ± SD or median with interquartile range and frequencies and percentages were used to represent the categorical variables. A comparison of continuous variables was done using independent t-tests or Mann-Whitney U tests while chi-square or Fisher exact tests were used when comparing categorical variables. The cut-off point at which the p-value was considered significant was less than 0.05.

The ethical committees of THQ Hospital, Ali Pur, Muzaffargarh and Services Hospital, Lahore gave their ethical approvals. The informed consent was also written, and patient confidentiality was observed, as stipulated by the ethical standards of research.

RESULTS

The final analysis was done on 120 patients who had an elective gastrointestinal and cardiovascular surgery. Among these 60 patients were treated with the help of ERAS-based perioperative care, and 60 patients were treated with the help of the traditional perioperative management. All the registered patients took part in the study protocol and none of the patients was excluded because of the missing or incomplete information.

Basic Demographic and Clinical Characteristics: The demographic and clinical characteristics of the patients in the 2 groups were similar at the baseline. The patients in the ERAS group had a mean age of 52.4 alike 11.6 years, whereas the patients in conventional care group had a mean age of 53.1 alike 12.2 years. The female proportion of the study sample was very high since it comprised 36.7 and 33.3% in the ERAS and conventional group, respectively, and no statistical significant difference in gender balance between the two groups. Even the body mass index, comorbidity conditions including hypertension and diabetes mellitus, and ASA physical status were comparably distributed in the two cohorts. Moreover, the share of gastrointestinal and cardiovascular surgeries was balanced, which guaranteed the comparability of the bases. Table 1 describes these baseline characteristics.

Table 1: Baseline demographic and clinical characteristics of study participants

Variable	ERAS Group (n = 60)	Conventional Group (n = 60)	p-value
Age (years), mean ± SD	52.4 ± 11.6	53.1 ± 12.2	0.74
Male gender, n (%)	38 (63.3)	40 (66.7)	0.70
Female gender, n (%)	22 (36.7)	20 (33.3)	0.70
BMI (kg/m²), mean ± SD	26.8 ± 3.9	27.1 ± 4.1	0.65
Hypertension, n (%)	31 (51.7)	33 (55.0)	0.72
Diabetes mellitus, n (%)	27 (45.0)	29 (48.3)	0.71
Gastrointestinal surgeries, n (%)	34 (56.7)	32 (53.3)	0.71
Cardiovascular surgeries, n (%)	26 (43.3)	28 (46.7)	0.71

Postoperative Recovery Milestones: Patients who were treated with the ERAS protocols exhibited much faster postoperative recovery milestones than those who were treated through conventional care. The average oral intake time was significantly less in ERAS (1.2 days 0.5 days) than in the conventional (2.6 days 0.8 days, p = 0.001). The mobilization was also realized earlier in case of ERAS patients as ambulation was started at 1.1 ± 0.4 days as compared to 2.4 ± 0.7 days in the traditional group (p < 0.001). The bowel functionality was restored much earlier with the ERAS group of patients with gastrointestinal surgery. The application of ERAS in the patient with cardiovascular surgery was linked to

reduction in mechanical ventilation and intensive care unit duration. The summary of these recovery results is presented in Table 2.

Postoperative Complications: The overall rate of postoperative complications was considerably low among patients who were operated using ERAS measures. The ERAS group had fewer complications like postoperative ileus, pulmonary complications and atrial fibrillation. Notably, the rates of complications did not depend on the gender composition, which implies that both men and women could enjoy the benefits of ERAS. The general complication rate among the ERAS group (18.3) was lower than that among the conventional care group (36.7) ($p = 0.03$). Table 3 provides a detailed comparison of the postoperative complications.

Table 2: Comparison of postoperative recovery milestones between groups

Outcome	ERAS Group	Conventional Group	p-value
Time to first oral intake (days)	1.2 ± 0.5	2.6 ± 0.8	<0.001
Time to mobilization (days)	1.1 ± 0.4	2.4 ± 0.7	<0.001
Time to bowel movement (days)*	2.1 ± 0.6	3.5 ± 0.9	<0.001
Duration of ventilation (hours)**	8.4 ± 3.1	14.6 ± 4.8	<0.001
ICU stay (days)**	1.9 ± 0.7	3.2 ± 1.1	<0.001

*Gastrointestinal surgery patients only
**Cardiovascular surgery patients only

Table 3: Postoperative complications in ERAS and conventional care groups

Complication	ERAS Group n (%)	Conventional Group n (%)	p-value
Surgical site infection	5 (8.3)	10 (16.7)	0.18
Postoperative ileus	4 (6.7)	11 (18.3)	0.04
Pulmonary complications	3 (5.0)	9 (15.0)	0.06
Atrial fibrillation**	2 (3.3)	8 (13.3)	0.04
Any complication	11 (18.3)	22 (36.7)	0.03

**Cardiovascular surgery patients only

Length of Hospital Stay and Discharge Outcomes: The length of stay in the hospital was much shorter in the patients in the ERAS group in contrast to those in conventional care. The average length of stay in the ERAS was 5.6 with a standard deviation of 1.9 days whereas the conventional group was 8.9 with a standard deviation of 2.7 ($p < 0.001$). The number of days of analgesia with opioids also decreased significantly in the case of ERAS patients. There was no significant difference in 30-day readmission rates among male and female patients and between the two study groups, which showed that there was safe early discharge. Table 4 illustrates these results.

Table 4: Length of hospital stay and discharge outcomes

Outcome	ERAS Group	Conventional Group	p-value
Length of hospital stay (days)	5.6 ± 1.9	8.9 ± 2.7	<0.001
Opioid requirement (days)	2.1 ± 0.8	4.3 ± 1.2	<0.001
30-day readmission, n (%)	3 (5.0)	5 (8.3)	0.47

Inclusion of both male and female patients demonstrated that ERAS protocols significantly improved postoperative recovery outcomes irrespective of gender. Faster recovery milestones, reduced complications, shorter hospital stay, and decreased opioid use collectively support the effectiveness of ERAS pathways in both gastrointestinal and cardiovascular surgeries.

DISCUSSION

This randomized prospective observational study shows that the use of Enhanced Recovery After Surgery (ERAS) in gastrointestinal and cardiovascular surgeries positively influences post-operative recovery outcomes in comparison with the traditional perioperative care[12]. Patients treated in ERAS paths realized the earlier functional recovery, they had fewer postoperative complications, shorter hospital stays, and had lower opioid needs without related escalation of readmission. These results underpin the increasing body of literature on the topic of ERAS as a safe and efficient model of perioperative care in a variety of surgical specialties[13,14].

The implementation of ERAS in the current study was also linked to a much faster accomplishment of the primary postoperative milestones, such as the earlier beginning of the oral intake and mobilization. The key elements of ERAS include early feeding and mobilization which has been known to reduce insulin resistance, muscle mass, and postoperative ileus and pulmonary complications[15]. The earlier bowel functionality of patients in the ERAS group who underwent gastrointestinal surgery is consistent with the literature that has indicated that postoperative ileus is less frequent and gastrointestinal recovery improves with the introduction of ERAS. These advantages have a direct impact on reduced hospitalization and comfort of the patient[16].

Patients under cardiovascular surgery who were treated in line with the ERAS protocols reported a shorter period of time on mechanical ventilators and a reduced period in the intensive care unit. The findings agree with the current cardiac ERAS literature, which suggests emphasizing the fast-track extubation and opioid-sparing anesthesia and early physiotherapy as the primary determinants of the enhanced cardiopulmonary functional recovery[17]. Shortened ventilation period does not only reduce the risk of ventilator-associated complications but also helps people leave the critical care environment sooner and be discharged, thus using the available resources more efficiently[18].

An interesting observation of the research is that the overall rate of postoperative complications in the ERAS group is much lower. The incidence of complications like postoperative ileus, pulmonary infections, and atrial fibrillation was lower in the patients who were under the care of ERAS. Notably, the ERAS benefits were also noted in both genders (male and female), and no difference in the recovery rates was found based on gender. This indicates that ERAS protocols offer fair benefits regardless of the gender and make them generally applicable across mixed surgical populations[19,20].

This decrease in length of stay in the hospital seen in the ERAS group is one of the most economically and clinically significant outcomes. Reduced hospitalization saves on healthcare expenditures, exposure to hospital-acquired infections is minimized, and the provision of bed capacity in large-volume public sector hospitals is also enhanced. These benefits are especially important in resource-constrained medical facilities like Pakistan, where ERAS becomes a viable resource to increase efficiency and patient safety without detrimentally affecting the latter[13-15].

This study has limitations even though it has its strengths. Selection bias could affect the observational design, and it was impossible to randomize because of the institutional practice patterns. Also, there was no measurement of long-term functional outcome and quality-of-life. Nevertheless, the multicenter format, standardized data collection, and both gastrointestinal and cardiovascular surgeries increase the external validity of the result[16].

On the whole, the findings of this work evidence the introduction of ERAS protocols in the standard perioperative care patterns. Further training of medical staffs, institutional dedication, and standardization of protocols are necessary to consider effective and efficient implementation of ERAS[20].

CONCLUSION

Enhanced Recovery After Surgery guidelines are highly beneficial in the recovery of patients that have undergone gastrointestinal and cardiovascular surgeries. The implementation of ERAS is linked to a quicker pace of functional recovery, less postoperative complications, shorter period of hospitalization and a lowered requirement of opioids without raising the readmission rates. Such advantages are present in both men and women patients. ERAS implementation can improve patient outcomes and the efficient use of healthcare resources, especially in low- and middle-income environments, in tertiary care hospitals. Subsequent studies that would concentrate on long-term outcomes are also supported to make ERAS a standard of care in the surgical practice.

Availability of Data and Materials: The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.
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