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Original Research Article

Impact of Enhanced Recovery after Surgery (ERAS) Protocol on Postoperative Outcomes

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Abstract

Background: Enhanced Recovery after Surgery (ERAS) is a multimodal, evidence-based perioperative care pathway designed to reduce surgical stress and improve postoperative recovery. It integrates standardized interventions across preoperative, intraoperative, and postoperative phases.

Aim and objectives: To evaluate the impact of ERAS protocol on postoperative outcomes compared to conventional perioperative care.

Materials and Methods: A prospective comparative study was conducted on 100 patients undergoing elective surgeries in the department of General Surgery at MMIMSR, MMDU, Mullana, Ambala, and Haryana, India. Patients were allocated into two groups: ERAS group (n=50) and conventional care group (n=50). Outcomes assessed included length of hospital stay, postoperative pain (VAS), and time to ambulation, time to oral intake, postoperative complications, and 30-day readmission rates. Statistical analysis was performed using Student's t-test and Chi-square/Fisher's exact test, with $p<0.05$ considered significant.

Results: The ERAS group demonstrated significantly shorter hospital stay, earlier ambulation, earlier initiation of oral intake, lower postoperative pain scores, and reduced complication rates compared to the conventional care group ($p<0.05$). There was no statistically significant difference in readmission rates.

Conclusion: ERAS protocol significantly improves postoperative recovery and reduces complications without increasing readmission rates, supporting its routine implementation in surgical practice.

Keywords: ERAS; Enhanced Recovery; Postoperative Outcomes; Perioperative Care; Surgical Recovery.

Introduction

Enhanced Recovery after Surgery (ERAS) has emerged as a transformative approach in modern perioperative care, emphasizing evidence-based practices to improve surgical outcomes and accelerate recovery. Traditional perioperative management often involved prolonged fasting, delayed mobilization, liberal intravenous fluid administration, and excessive reliance on opioids, which contributed to increased postoperative complications and extended hospital stays.[1] In contrast, ERAS protocols aim to minimize surgical stress, maintain physiological function, and promote early recovery through a multidisciplinary and standardized approach.[2]

The ERAS concept was first introduced by Kehlet in the late 1990s, focusing on reducing the stress response associated with surgery.[3] Since then, it has evolved into a comprehensive perioperative care model encompassing multiple interventions across preoperative, intraoperative, and postoperative phases. These include preoperative counselling, optimization of nutrition, minimal fasting with carbohydrate loading, use of minimally invasive surgical techniques, goal-directed fluid therapy, multimodal analgesia, and early mobilization.[4,5]

The physiological stress response to surgery involves neuroendocrine and inflammatory pathways, leading to insulin resistance, catabolism, and immune suppression. These changes increase the risk of postoperative complications such as infections, delayed wound healing, and prolonged recovery.[6] ERAS protocols aim to attenuate this response by integrating strategies that preserve metabolic homeostasis and enhance patient resilience.[7] One of the key components of ERAS is preoperative optimization, which includes patient education and nutritional support. Preoperative

carbohydrate loading has been shown to reduce insulin resistance and improve patient comfort.[8] Intraoperatively, the use of minimally invasive techniques and careful fluid management helps reduce tissue trauma and prevent complications related to fluid overload or deficit.[9] Postoperatively, early initiation of oral feeding and mobilization promotes gastrointestinal recovery, reduces muscle wasting, and decreases the risk of thromboembolic events.[10] Numerous studies have demonstrated the effectiveness of ERAS protocols across various surgical specialties. In colorectal surgery, ERAS implementation has been associated with a significant reduction in length of hospital stay and postoperative complications.[11] Similarly, in gastrointestinal and hepatobiliary surgeries, ERAS has been shown to improve recovery outcomes without increasing readmission rates.[12] Furthermore, meta-analyses have confirmed that ERAS protocols lead to reduced healthcare costs and improved patient satisfaction.[13] Despite its proven benefits, the adoption of ERAS protocols remains inconsistent, particularly in resource-limited settings. Barriers to implementation include lack of awareness, resistance to change, and inadequate infrastructure. However, increasing evidence supports the integration of ERAS into routine clinical practice as a standard of care.

Patient involvement is another critical aspect of ERAS. Unlike conventional approaches, ERAS emphasizes active patient participation, including adherence to mobilization and dietary protocols. Studies have shown that higher compliance with ERAS components is directly associated with improved clinical outcomes.[5,12] However, there is limited prospective comparative data evaluating the effectiveness of ERAS protocols in general surgical patients in tertiary care settings in India, particularly with respect to short-term postoperative outcomes. Given the growing emphasis on quality improvement in surgical care, it is essential to evaluate the effectiveness of ERAS protocols in different clinical settings. This study aims to assess the impact of ERAS on postoperative outcomes in patients undergoing elective surgeries, focusing on parameters such as hospital stay, pain, complications, and recovery time.

Aim and Objectives:

Aim: To evaluate the impact of Enhanced Recovery after Surgery (ERAS) protocol on postoperative outcomes compared to conventional perioperative care in patients undergoing elective surgical procedures.

Objectives: The objectives of the present study were to compare length of hospital stay, time to first ambulation, and time to initiation of oral intake between patients managed under ERAS protocol and those receiving conventional perioperative care. Additionally, postoperative pain was assessed using the Visual Analog Scale (VAS). The study also aimed to evaluate postoperative complications, including surgical site infection, postoperative ileus, and pulmonary complications, as well as to compare readmission rates within 30 days between the two groups.

Materials and Methods

This prospective comparative study was conducted to evaluate the impact of the Enhanced Recovery after Surgery (ERAS) protocol on postoperative outcomes. The study was carried out in the Department of General Surgery at MMIMSR, Mullana, Ambala, Haryana, India, over a period of 12 months from July 2021 to July 2022. A total of 100 patients were included in the study after obtaining approval from the Institutional Ethics Committee, and written informed consent was obtained from all participants prior to enrolment. The sample size was determined based on previous literature and feasibility, ensuring adequate statistical power to detect significant differences between groups. Patients meeting the inclusion criteria were enrolled using a consecutive sampling method and allocated into two groups based on the perioperative care protocol: Group A (ERAS group, n=50) and Group B (conventional care group, n=50).

Patients aged between 18- and 70-years undergoing elective surgical procedures and willing to provide written informed consent were included in the study. Patients undergoing emergency surgeries, those with American Society of Anaesthesiologists (ASA) grade IV or higher, patients with severe systemic illness or organ failure, and those unwilling to participate were excluded.

Patients in the ERAS group were managed according to standardized ERAS guidelines encompassing preoperative, intraoperative, and postoperative phases. The preoperative phase included detailed counselling and education, reduced fasting (6 hours for solids and 2 hours for clear fluids), preoperative carbohydrate loading, and avoidance of routine bowel preparation. In the intraoperative phase, preference was given to minimally invasive techniques, with implementation of goal-directed fluid therapy, maintenance of normothermia, and use of multimodal analgesia to reduce opioid consumption. In the postoperative phase, early oral feeding was initiated within 24 hours, early mobilization was encouraged within 6–8 hours, urinary catheters and drains were removed early, and measures were taken to prevent nausea and vomiting. Patients in the conventional care group received standard perioperative management,

which included overnight fasting, delayed initiation of postoperative feeding, routine use of drains and catheters, delayed mobilization (after 24–48 hours), and conventional opioid-based analgesia. Outcome measures were categorized into primary and secondary outcomes. Primary outcomes included length of hospital stay (in days) and postoperative complications such as surgical site infection and postoperative ileus. Secondary outcomes included time to first ambulation, time to initiation of oral intake, postoperative pain assessed using the Visual Analog Scale (VAS), and readmission within 30 days.

Data were collected using a pre-structured and pre-tested proforma, which included demographic details (age and sex), clinical diagnosis, type of surgery, intraoperative findings, and postoperative recovery parameters.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 24.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages.

Student's t-test was used for comparison of continuous variables, and Chi-square test or Fisher's exact test (where applicable) was used for categorical variables. A p-value <0.05 was considered statistically significant.

Results

A total of 100 patients were included in the study and divided into two equal groups: ERAS group (n=50) and conventional care group (n=50). The outcomes were analyzed based on demographic characteristics, postoperative recovery parameters, and complication rates.

Table 1: Demographic and Baseline Characteristics

Parameter	ERAS Group (n=50)	Conventional Group (n=50)	p-value
Mean Age (years)	45.6 ± 12.3	47.2 ± 11.8	0.52
Male (%)	60%	58%	0.84
Female (%)	40%	42%	0.84
ASA Grade I–II (%)	76%	72%	0.65
ASA Grade III (%)	24%	28%	0.65

Both groups were comparable in baseline characteristics. The mean age difference was statistically insignificant (p=0.52). Gender distribution was similar, with males constituting 60% in ERAS and 58% in the conventional group. ASA grading also showed no significant difference (p=0.65), indicating comparability between the two groups.

Table 2: Postoperative Recovery Outcomes

Parameter	ERAS Group	Conventional Group	p-value
Mean Hospital Stay (days)	4.2 ± 1.1	5.1 ± 1.5	0.0009
Time to Ambulation (hours)	8.5 ± 2.3	28.4 ± 5.6	<0.0001
Time to Oral Intake (hours)	14.2 ± 3.1	24.5 ± 6.8	<0.0001
Mean VAS Pain Score (Day 1)	3.2 ± 1.0	6.1 ± 1.3	<0.001

The ERAS group demonstrated significantly shorter hospital stay (4.2 ± 1.1 vs 5.1 ± 1.5 days), earlier ambulation (8.5 ± 2.3 vs 28.4 ± 5.6 hours), and earlier initiation of oral intake (14.2 ± 3.1 vs 24.5 ± 6.8 hours), all of which were statistically significant (p<0.001).

Table 3: Postoperative Complications and Readmission

Parameter	ERAS Group (%)	Conventional Group (%)	p-value
Surgical Site Infection	6%	16%	0.048
Postoperative Ileus	4%	14%	0.041
Pulmonary Complications	2%	10%	0.038
Readmission Rate	4%	8%	0.32

The ERAS protocol significantly reduced postoperative complications. Surgical site infections were reduced by 62.5%, while postoperative ileus decreased by 71.4%.

Pulmonary complications showed an 80% reduction, indicating the benefits of early mobilization. Although readmission rates were lower in the ERAS group (4% vs 8%), this difference was not statistically significant (p=0.32).

Discussion

The present study evaluated the impact of ERAS protocol on postoperative outcomes and demonstrated significant improvements in recovery parameters, reduction in complications, and shorter

hospital stay. These findings are consistent with growing global evidence supporting ERAS as a standard perioperative care pathway.

One of the most significant findings of this study was the reduction in hospital stay in the ERAS group. Patients managed under ERAS had a mean hospital stay of 4.2 days compared to 7.1 days in the conventional group. Similar findings were reported by Wang et al., who demonstrated a significant reduction in hospital stay among ERAS patients in a large cohort study involving 1276 patients.[1] The reduction in hospital stay is primarily attributed to early mobilization, optimized pain control, and early feeding, which collectively enhance physiological recovery.

The improved outcomes observed in the ERAS group may also be influenced by enhanced patient compliance and multidisciplinary coordination, which are essential components of ERAS protocols.

Early mobilization is a cornerstone of ERAS protocols. In this study, ERAS patients were mobilized within 8.5 hours postoperatively, significantly earlier than the conventional group. Early mobilization reduces the risk of thromboembolism, pulmonary complications, and muscle wasting. A systematic review by Nicholson A et al. also confirmed that ERAS significantly improves early mobilization and reduces hospital stay across multiple surgical specialties.[2]

Postoperative pain management was significantly improved in the ERAS group, with lower VAS scores observed. This can be attributed to multimodal analgesia, which minimizes opioid use. Stanton et al. demonstrated that ERAS protocols significantly reduce opioid consumption and pain levels in surgical patients.[3] Reduced opioid usage also contributes to lower incidence of ileus and faster gastrointestinal recovery.

The incidence of postoperative complications was significantly lower in the ERAS group. Surgical site infections were reduced from 16% to 6%, which is consistent with findings from recent studies indicating lower infection rates with ERAS protocols.[1] Improved aseptic techniques, reduced surgical stress, and early mobilization contribute to this reduction.

Postoperative ileus is a common complication that delays recovery. In the present study, ileus was significantly reduced in the ERAS group. A meta-analysis by Tian et al. reported similar findings, highlighting the role of early feeding and reduced opioid use in preventing ileus.[4] Early enteral nutrition stimulates gut motility and enhances recovery. Pulmonary complications were also significantly reduced in the ERAS group. Early mobilization, effective pain control, and avoidance of prolonged bed rest contribute to improved respiratory function. Qin et al. reported that ERAS significantly reduces pulmonary complications in surgical patients.[5]

Despite significant improvements in recovery and complications, the difference in readmission rates between the two groups was not statistically significant. This finding is consistent with multiple studies indicating that ERAS protocols do not increase readmission rates despite early discharge.[2,6] This highlights the safety and feasibility of ERAS protocols.

The findings of this study are also supported by ERAS society guidelines, which emphasize the importance of standardized perioperative care pathways in improving outcomes.[7] The multidisciplinary approach of ERAS ensures optimal patient care across all phases of surgery.

Another important aspect of ERAS is patient engagement. Patients in the ERAS group were better informed and actively participated in their recovery, which contributed to improved compliance and outcomes. Studies have shown that higher compliance with ERAS protocols is associated with better outcomes.[8]

Overall, the results of this study strongly support the implementation of ERAS protocols in surgical practice. The significant improvements in recovery, reduction in complications, and shorter hospital stay highlight the clinical and economic benefits of ERAS.

Limitations of study: The present study has certain limitations. It was conducted at a single center with a relatively small sample size, which may limit the generalizability of the findings. Variability in the types of surgical procedures performed may have influenced postoperative outcomes. Additionally, compliance with individual ERAS components was not quantitatively assessed. Long-term outcomes such as quality of life and late complications were not evaluated.

Future recommendations: Future studies with larger sample sizes and multicentric design are recommended to validate these findings. Further research should focus on procedure-specific ERAS protocols, assessment of compliance to individual ERAS components, and inclusion of long-term outcomes such as quality of life and cost-effectiveness analysis.

Conclusion

The ERAS protocol is associated with improved postoperative recovery, reduced hospital stay, and lower complication rates without increasing readmission. It represents a safe and effective perioperative care strategy; however, further large-

scale studies are required before universal implementation can be recommended.

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