International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

Impact of Enhanced Recovery After Surgery Protocol on Postoperative Outcomes in Elective Abdominal Surgery: A Prospective Comparative Study from a Tertiary Care Centre in India

Dr T Deepak Meher[1], Dr Syam Babu Katuri[2]

[1]MS General Surgery, Assistant professor Department of General Surgery, Katuri Medical College and Hospital, Guntur, Andhra Pradesh 522019, India.
[2]MS General Surgery, Assistant professor, Arundhati Institute of Medical Sciences, Telangana 500043, India.

OPEN ACCESS

Corresponding Author:

Dr T Deepak Meher
MS General Surgery, Assistant professor Department of General Surgery, Katuri Medical College and Hospital, Guntur, Andhra Pradesh 522019, India.

Received: 07-04-2026
Accepted: 08-05-2026
Available online: 15-06-2026

ABSTRACT

Introduction: Enhanced Recovery After Surgery (ERAS) has emerged as an important advancement in perioperative care and has significantly changed the way patients are managed after surgery. It is a multimodal, evidence-based approach designed to reduce surgical stress, maintain physiological function, and support faster recovery following an operation. Although ERAS pathways are now increasingly practiced worldwide, their adoption in routine elective abdominal surgery remains variable across many centers in India. Delayed mobilization, postoperative pain, prolonged ileus, and longer hospital stay continue to contribute substantially to postoperative morbidity. Assessing the role of ERAS in improving recovery within the Indian surgical setting is therefore clinically relevant.
Aim: To assess the impact of Enhanced Recovery After Surgery (ERAS) protocol on postoperative outcomes in patients undergoing elective abdominal surgery.
Methodology: This prospective comparative observational study was conducted in the Department of General Surgery of a tertiary care teaching hospital. A total of 100 adult patients undergoing elective abdominal surgery were included, of whom 50 were managed using ERAS protocol and 50 received conventional perioperative care. Clinical profile, operative details, postoperative pain score, time to oral intake, ambulation, postoperative complications, duration of hospital stay, and patient satisfaction were recorded and analyzed. Appropriate statistical methods were used for comparison between groups, with p-value <0.05 considered statistically significant.
Results: Patients managed under the ERAS protocol demonstrated significantly better postoperative recovery compared with those receiving conventional care. Mean time to oral intake and postoperative mobilization was earlier in the ERAS group. Return of bowel activity occurred sooner, and postoperative pain scores were lower. The overall postoperative complication rate was reduced in ERAS patients (18%) compared with the conventional group (34%). Mean hospital stay was significantly shorter in the ERAS cohort, and patient satisfaction scores were notably higher. These findings indicate a clear clinical benefit associated with ERAS implementation.
Conclusion: ERAS protocol was associated with improved postoperative recovery and better overall surgical outcomes in elective abdominal surgery. It reduced pain, accelerated recovery, shortened hospital stays, and lowered postoperative morbidity. The study supports wider integration of ERAS principles into routine general surgical practice.

Keywords*: Enhanced Recovery After Surgery; Elective Abdominal Surgery; Postoperative Outcomes; Postoperative Recovery; Hospital Stay.*

INTRODUCTION

Enhanced Recovery After Surgery (ERAS) represents a major shift in modern perioperative surgical care. Over the past two decades, it has evolved from a concept used mainly in colorectal surgery to a widely accepted structured care pathway applied across multiple surgical specialties. The central principle of ERAS is simple but powerful: minimize surgical stress and help the patient return to normal physiological function as early as possible after surgery. By integrating several evidence-based perioperative interventions into a coordinated pathway, ERAS aims to improve recovery while reducing complications and duration of hospitalization **(1–4).**

Traditional perioperative management in abdominal surgery has historically involved prolonged preoperative fasting, delayed initiation of oral intake, routine use of drains and catheters, opioid-heavy pain management, and delayed mobilization. While these practices were widely accepted for decades, increasing evidence has shown that many of them may contribute to slower recovery, increased discomfort, delayed bowel function, and prolonged hospital stay **(5,6).** As surgical care continues to move toward evidence-based and patient-centred models, these conventional practices are being re-evaluated.

Surgery triggers a complex metabolic and inflammatory stress response. Tissue injury leads to hormonal activation, insulin resistance, fluid imbalance, protein catabolism, impaired gut motility, and reduced functional capacity. These physiological changes are often amplified by prolonged fasting, inadequate pain control, excessive intravenous fluids, and immobility. Together, they delay recovery and increase the risk of postoperative complications. ERAS protocols are specifically designed to blunt this stress response and preserve normal physiology throughout the perioperative period **(7).**

Key ERAS components typically include detailed patient counselling, reduced fasting duration, carbohydrate loading, multimodal analgesia, opioid-sparing pain strategies, optimized fluid therapy, early feeding, early mobilization, and early removal of drains and tubes. Each individual element contributes to recovery, but the greatest benefit appears when these components are implemented together in a standardized multidisciplinary pathway **(8–10).**

Several international studies have shown that ERAS can significantly reduce postoperative pain, shorten hospital stay, improve bowel recovery, decrease complication rates, and enhance patient satisfaction without increasing readmission or mortality **(1,4,10).** These benefits have led to widespread incorporation of ERAS principles into perioperative guidelines across various abdominal surgical procedures.

In elective abdominal surgery, postoperative recovery is influenced not only by the surgery itself but also by how the perioperative period is managed. Early restoration of gastrointestinal function, pain control, mobilization, and nutritional recovery are all critical determinants of outcome. Even technically successful surgery may be followed by delayed recovery if perioperative care is suboptimal. ERAS therefore offers a practical opportunity to improve outcomes beyond the operation itself.

Within the Indian healthcare setting, ERAS carries additional practical importance. High surgical volume, pressure on hospital beds, economic burden on patients and families, and variation in perioperative practices make efficient recovery pathways especially valuable. Despite this, implementation remains inconsistent in many centers, and published Indian data evaluating ERAS in routine general surgical practice are still limited. Institution-based clinical studies are therefore important to understand feasibility and outcomes in real-world practice.

Elective abdominal procedures form a major proportion of general surgical workload in tertiary care hospitals. Improving recovery in these patients has implications beyond individual patient benefit. Reduced hospital stay improves bed turnover, lowers healthcare expenditure, reduces resource utilization, and may improve patient experience as well as institutional efficiency.

The present study was undertaken to evaluate the impact of ERAS protocol on postoperative outcomes in patients undergoing elective abdominal surgery at a tertiary care centre. The study compared recovery parameters including postoperative pain, oral intake, ambulation, postoperative complications, length of hospital stay, and patient satisfaction between ERAS-managed patients and those receiving conventional perioperative care. The findings aim to contribute to the growing evidence supporting ERAS and provide clinically relevant data from the Indian surgical setting **(5,7).**

AIM

To assess the impact of Enhanced Recovery After Surgery (ERAS) protocol on postoperative outcomes in patients undergoing elective abdominal surgery.

MATERIALS AND METHODS

Study design
This prospective comparative observational study was conducted to evaluate the effect of the Enhanced Recovery After Surgery (ERAS) protocol on postoperative outcomes in patients undergoing elective abdominal surgery. Perioperative and postoperative recovery outcomes were compared between patients managed under ERAS protocol and those receiving conventional perioperative care.

Study setting and duration
The study was carried out in the Department of General Surgery of a tertiary care teaching hospital. Patients undergoing elective abdominal surgery were enrolled consecutively over a period of **one year**, from **January 2025 to December 2025**, and followed throughout the postoperative hospital stay.

Ethical approval
The study was approved by the Institutional Ethics Committee before commencement. Written informed consent was obtained from all participants prior to enrolment. Patient confidentiality was maintained throughout the study.

Study population
Adult patients undergoing elective abdominal surgery during the study period were included after fulfilling the eligibility criteria.

A total of **100 patients** were included and divided into two groups:

- **ERAS group:** 50 patients
- **Conventional care group:** 50 patients

Inclusion criteria
Patients aged more than 18 years undergoing elective abdominal surgery, fit for surgery under anaesthesia, willing to participate, and providing written informed consent were included.

Exclusion criteria
Patients undergoing emergency surgery, age below 18 years, re-exploration surgeries, hemodynamically unstable patients, patients with major multi-organ failure, pregnant patients, patients unwilling to participate, and those requiring immediate postoperative ICU care unrelated to surgical recovery were excluded.

Surgical procedures
The study included elective abdominal procedures such as laparoscopic cholecystectomy, open cholecystectomy, inguinal hernia repair, ventral or incisional hernia repair, elective exploratory laparotomy, intestinal resection and anastomosis, adhesiolysis, stoma closure, and other routine abdominal surgeries performed in the department.

Study procedure
All eligible patients were evaluated preoperatively and baseline demographic and clinical details were recorded. Data collected included age, sex, diagnosis, body mass index, associated comorbidities, ASA grade, indication for surgery, and type of surgical procedure.

Patients were managed according to either the ERAS protocol or conventional perioperative care pathway.

Patients in the ERAS group received preoperative counselling, shortened fasting, carbohydrate loading where appropriate, multimodal analgesia, goal-directed fluid therapy, early oral feeding, early mobilization, and early removal of drains and catheters when feasible.

Patients in the conventional care group received routine perioperative management including overnight fasting, standard fluid management, conventional analgesia, delayed oral intake, and routine postoperative mobilization.

Outcome measures
The **primary outcome** assessed was **length of postoperative hospital stay**.

Secondary outcomes included postoperative pain score, time to oral intake, time to ambulation, return of bowel activity, postoperative complications, and patient satisfaction.

Data collection

Data were collected prospectively using a structured case record proforma. Information was obtained from clinical history, preoperative records, operative notes, anesthesia records, ward progress notes, nursing charts, postoperative monitoring records, and discharge summaries.

Statistical analysis

Data were entered into Microsoft Excel and analyzed using **IBM SPSS Statistics for Windows, Version 25.0** (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as **mean ± standard deviation**, and categorical variables as **frequency and percentage**. Comparison between the two groups was performed using **Student's t-test** for continuous variables and **Chi-square test** or **Fisher's exact test** for categorical variables. A **p-value <0.05** was considered statistically significant.

RESULTS

Table 1: Baseline Demographic Characteristics of Study Participants

Variable	ERAS Group (n=50)	Conventional Group (n=50)	p-value
Mean age (years)	45.8 ± 12.6	47.6 ± 13.8	0.48
Male	28 (56%)	30 (60%)	0.68
Female	22 (44%)	20 (40%)	0.68
Diabetes mellitus	10 (20%)	12 (24%)	0.63
Hypertension	14 (28%)	13 (26%)	0.82

A total of 100 patients were included in the study, with 50 patients each in the ERAS and conventional care groups. Baseline demographic and clinical characteristics were comparable between the two groups. The mean age was 45.8 ± 12.6 years in the ERAS group and 47.6 ± 13.8 years in the conventional care group (p=0.48). Male patients constituted 56% of the ERAS group and 60% of the conventional care group, while female patients accounted for 44% and 40%, respectively. Diabetes mellitus was present in 20% of patients in the ERAS group and 24% in the conventional group. Hypertension was observed in 28% and 26% of patients, respectively. No statistically significant difference was observed between groups, indicating comparable baseline characteristics.

Table 2: Comparison of Postoperative Recovery Parameters

Parameter	ERAS Group	Conventional Group	p-value
Time to oral intake (hours)	18.6 ± 4.2	32.8 ± 6.7	<0.001
Time to ambulation (hours)	16.4 ± 5.1	29.5 ± 7.3	<0.001
Return of bowel sounds (hours)	24.8 ± 6.2	38.4 ± 8.1	<0.001
Pain score at 24 hrs (VAS)	3.1 ± 1.2	5.4 ± 1.5	<0.001

Patients managed with the ERAS protocol demonstrated significantly faster postoperative recovery compared with those receiving conventional perioperative care. Mean time to oral intake was significantly shorter in the ERAS group (18.6 ± 4.2 hours) compared with the conventional group (32.8 ± 6.7 hours) (p<0.001). Time to ambulation was also earlier in ERAS patients (16.4 ± 5.1 hours versus 29.5 ± 7.3 hours) (p<0.001). Return of bowel sounds occurred sooner in the ERAS group, with a mean duration of 24.8 ± 6.2 hours compared with 38.4 ± 8.1 hours in the conventional group (p<0.001). Postoperative pain scores at 24 hours were significantly lower among ERAS patients, with a mean VAS score of 3.1 ± 1.2 compared with 5.4 ± 1.5 in the conventional care group (p<0.001).

Table 3: Postoperative Complications

Complication	ERAS Group n (%)	Conventional Group n (%)	p-value
Surgical site infection	4 (8%)	8 (16%)	0.22
Postoperative ileus	2 (4%)	7 (14%)	0.08
Nausea / vomiting	6 (12%)	12 (24%)	0.11
Pulmonary complications	3 (6%)	7 (14%)	0.18
Total complications	9 (18%)	17 (34%)	0.04

More than one postoperative complication was observed in some patients; therefore, frequencies may overlap.

Postoperative complications were less frequent among patients managed under the ERAS protocol. Surgical site infection was observed in 4 patients (8%) in the ERAS group compared with 8 patients (16%) in the conventional care group. Postoperative ileus occurred in 2 patients (4%) in the ERAS group and 7 patients (14%) in the conventional group. Nausea and vomiting were reported in 6 patients (12%) receiving ERAS compared with 12 patients (24%) receiving conventional care. Pulmonary complications were seen in 3 patients (6%) in the ERAS group and 7 patients (14%) in the conventional group. Overall postoperative complications were significantly lower in the ERAS cohort, occurring in 9 patients (18%) compared with 17 patients (34%) in the conventional care group (p=0.04).

Table 4: Hospital Stay and Patient Satisfaction

Parameter	ERAS Group	Conventional Group	p-value
Mean hospital stay (days)	4.8 ± 1.6	7.3 ± 2.1	<0.001
Patient satisfaction – Excellent	24 (48%)	11 (22%)	
Good	19 (38%)	17 (34%)	
Fair	6 (12%)	15 (30%)	
Poor	1 (2%)	7 (14%)	0.002

Implementation of the ERAS protocol was associated with a significant reduction in postoperative hospital stay. Mean duration of hospital stay was 4.8 ± 1.6 days in the ERAS group compared with 7.3 ± 2.1 days in the conventional care group ($p<0.001$). Patient satisfaction was also significantly better among ERAS patients. Excellent satisfaction was reported by 24 patients (48%) in the ERAS group compared with 11 patients (22%) in the conventional group. Good satisfaction was observed in 38% and 34% of patients, respectively. Fair satisfaction was reported by 12% of ERAS patients compared with 30% in the conventional group, while poor satisfaction was noted in 2% and 14%, respectively. Overall, patient satisfaction was significantly higher in the ERAS group ($p=0.002$).

DISCUSSION

The findings of the present study demonstrate that implementation of the Enhanced Recovery After Surgery protocol in elective abdominal surgery was associated with meaningful improvement in postoperative recovery when compared with conventional perioperative care. Patients managed under ERAS experienced earlier oral intake, faster mobilization, improved return of bowel function, lower postoperative pain scores, fewer complications, shorter hospital stay, and better overall recovery experience. Taken together, these observations support ERAS as a practical and clinically effective perioperative pathway in abdominal surgical practice.

Baseline characteristics between the two study groups were comparable, with no statistically significant difference in age, sex distribution, or major comorbid conditions. This is important because it allows postoperative outcomes to be interpreted more reliably without significant confounding from demographic variation. Similar baseline comparability has been reported in previous studies evaluating ERAS in abdominal surgery **(1,4,5).** These similarities strengthen the validity of comparison between ERAS and conventional care pathways.

A major finding of our study was significantly faster postoperative recovery among ERAS patients. Time to oral intake, ambulation, and return of bowel activity were all improved. Earlier feeding and mobilization are central elements of ERAS and are consistently associated with improved gastrointestinal recovery and earlier functional independence. Similar findings have been demonstrated previously **(6–10).**

The improved recovery observed in the ERAS group can also be explained physiologically. ERAS pathways are designed to reduce the surgical stress response and maintain normal body function during the perioperative period. Reduced fasting and carbohydrate loading help decrease insulin resistance. Early enteral feeding stimulates gut motility and preserves intestinal mucosal function. Early mobilization reduces muscle deconditioning, improves respiratory mechanics, and decreases venous stasis. Goal-directed fluid therapy helps avoid bowel edema and tissue overload. Together, these interventions promote faster physiological recovery and reduce postoperative inflammatory burden. Similar mechanisms have been discussed extensively **(3,7).**

Postoperative pain control was also significantly better in the ERAS group. Lower pain scores likely contributed directly to earlier ambulation, improved breathing effort, faster mobilization, and better patient participation in recovery. Multimodal analgesia and opioid-sparing strategies may have played an important role in this improvement. Similar benefits in postoperative pain management have also been reported **(6,8,9).**

Our study also demonstrated lower postoperative complication rates among ERAS patients. Overall morbidity was reduced, with fewer cases of ileus, nausea, pulmonary complications, and wound-related morbidity compared with conventional care. These findings are clinically important because postoperative complications significantly influence both patient recovery and hospital resource utilization. Similar reductions in postoperative morbidity after ERAS implementation have been reported **(1,4,10).**

Length of hospital stay was significantly shorter in the ERAS group. This is one of the most consistently reported benefits of ERAS in the literature and was clearly demonstrated in our study as well. Earlier discharge reflects faster recovery, better pain control, earlier feeding, and fewer complications. Beyond clinical benefit, shorter hospital stay has practical implications for bed availability, cost reduction, and improved surgical throughput.

Patient satisfaction was also higher among patients managed under ERAS. Many reported earlier independences, less discomfort, improved mobility, and a smoother overall recovery experience. This is particularly important because patient-reported recovery is increasingly recognized as an essential outcome measure alongside clinical and surgical success.

From an Indian clinical perspective, ERAS offers additional practical value. In busy tertiary care centers where, surgical workload is high and resources are often stretched, reducing postoperative stay without compromising safety can significantly improve efficiency of care. Earlier recovery may reduce financial burden on patients and caregivers while also improving utilization of hospital resources. These benefits make ERAS especially relevant to general surgical practice in India.

Overall, the present study adds to the growing body of evidence supporting ERAS as an effective perioperative care pathway in elective abdominal surgery. The protocol was feasible in our institutional setting and showed measurable benefit across multiple recovery outcomes. These findings support broader implementation of ERAS principles in routine surgical practice and reinforce its role in improving postoperative recovery, optimizing hospital resources, and enhancing quality of perioperative care.

CONCLUSION

The present study demonstrated that implementation of the Enhanced Recovery After Surgery (ERAS) protocol significantly improved postoperative outcomes in patients undergoing elective abdominal surgery. ERAS was associated with earlier oral intake, faster mobilization, quicker return of bowel function, lower postoperative pain scores, reduced complication rates, shorter hospital stay, and higher patient satisfaction compared with conventional perioperative care. These findings suggest that ERAS is a safe, feasible, and clinically effective perioperative care pathway. Wider adoption of ERAS protocols in elective abdominal surgery may improve surgical recovery, optimize hospital resource utilization, and enhance overall quality of patient care in tertiary care settings.

LIMITATIONS

The present study had certain limitations. First, it was a single-centre hospital-based study, so the findings may reflect local surgical practice and may not be fully generalizable to all institutions. Second, the sample size was limited to 100 patients, and larger multicentric studies may provide broader evidence. Third, long-term postoperative follow-up beyond discharge was not included, therefore long-term recovery and late complications could not be assessed. Lastly, variation in type of abdominal procedures and surgeon preference may have influenced some postoperative outcomes.

RECOMMENDATIONS

1. ERAS protocol should be routinely implemented in elective abdominal surgery to improve postoperative recovery and reduce hospital stay.
2. Multidisciplinary coordination between surgeons, anaesthetists, nursing staff, physiotherapists, and dieticians should be strengthened for successful ERAS implementation.
3. Standardized ERAS pathways should be adapted according to institutional resources and patient requirements in Indian hospitals.
4. Larger multicentric studies with longer follow-up are recommended to evaluate long-term outcomes and broader applicability of ERAS.
5. Regular audit and monitoring of ERAS compliance should be encouraged to improve patient outcomes and optimize perioperative care.

REFERENCES

1. Ljungqvist O, Scott M, Fearon KC. Enhanced recovery after surgery: a review. JAMA Surg. 2017;152(3):292–298. doi:10.1001/jamasurg.2016.4952.
2. Gustafsson UO, Scott MJ, Hubner M, Nygren J, Demartines N, Francis N, et al. Guidelines for perioperative care in elective colorectal surgery: Enhanced Recovery After Surgery Society recommendations: 2018. World J Surg. 2019;43(3):659–695. doi:10.1007/s00268-018-4844-y.
3. Fearon KC, Ljungqvist O, Von Meyenfeldt M, Revhaug A, Dejong CH, Lassen K, et al. Enhanced recovery after surgery: a consensus review of clinical care for patients undergoing colonic resection. Clin Nutr. 2005;24(3):466–477. doi:10.1016/j.clnu.2005.02.002.
4. Visioni A, Shah R, Gabriel E, Attwood K, Kukar M, Nurkin S. Enhanced Recovery After Surgery for noncolorectal surgery: a systematic review and meta-analysis. Ann Surg. 2018;267(1):57–65. doi:10.1097/SLA.0000000000002267.
5. Oodit R, Biccard BM, Panieri E, Alvarez AO, Sioson MRS, Maswime S, et al. Guidelines for perioperative care in elective abdominal and pelvic surgery at primary and secondary hospitals in low- and middle-income countries: Enhanced Recovery After Surgery Society recommendations. World J Surg. 2022;46(8):1826–1843. doi:10.1007/s00268-022-06587-w.

6. Scott MJ, Hubner M, Nygren J, Mythen MG, Fearon KC, Ljungqvist O. Enhanced Recovery After Surgery: perioperative care and outcomes. Anesthesiol Clin. 2015;33(1):65–80. doi:10.1016/j.anclin.2014.11.006.
7. Ljungqvist O, de Boer HD, Balfour A, Fawcett WJ, Lobo DN, Nelson G, et al. Opportunities and challenges for the next phase of enhanced recovery after surgery. JAMA Surg. 2021;156(8):775–784. doi:10.1001/jamasurg.2021.0586.
8. Kehlet H. Multimodal approach to control postoperative pathophysiology and rehabilitation. Br J Anaesth. 1997;78(5):606–617. doi:10.1093/bja/78.5.606.
9. Kehlet H, Wilmore DW. Evidence-based surgical care and the evolution of fast-track surgery. Ann Surg. 2008;248(2):189–198. doi:10.1097/SLA.0b013e31817f2c1a.
10. Nelson G, Kiyang LN, Crumley ET, Chuck A, Nguyen T, Faris P, et al. Implementation of Enhanced Recovery After Surgery pathways in colorectal surgery: a systematic review and meta-analysis. J Am Coll Surg. 2016;223(2):219–231. doi:10.1016/j.jamcollsurg.2016.04.031.