



EVALUATION OF THE EFFECTIVENESS OF ENHANCED RECOVERY AFTER SURGERY (ERAS) PROTOCOL ON POSTOPERATIVE OUTCOMES IN GENERAL SURGERY PATIENTS: A PROSPECTIVE COMPARATIVE STUDY

Dr. P. Hameed Farooq^{1*}, Dr S. Panchali²

¹*MBBS., MS, General Surgery, Assistant Professor, Department of General Surgery, Government Medical College Hospital, Dindigul, India.

²Department of General Surgery, Assistant Professor, Government Dindigul Medical College, Dindigul, India.

Corresponding Author: Dr. P. Hameed Farooq

Email: airmanzoor20@gmail.com

ABSTRACT

Background: Enhanced Recovery after Surgery (ERAS) protocols are multimodal, evidence-based perioperative care pathways designed to reduce surgical stress, promote early recovery, and improve postoperative outcomes. While ERAS is widely adopted in many surgical specialties, its effectiveness in general surgical procedures in resource-limited settings requires further validation.

Aim: To evaluate the effectiveness of ERAS protocol on postoperative outcomes compared with conventional perioperative care in patients undergoing elective general surgical procedures.

Materials and Methods: This prospective comparative study was conducted at the Department of General Surgery, Dindigul Medical College and Hospital, over one year (January–December 2023). A total of 200 patients undergoing elective general surgeries were enrolled and allocated into two groups: ERAS group (n=100) and conventional care group (n=100). ERAS included preoperative counselling, carbohydrate loading, early feeding, early mobilization, multimodal analgesia, and avoidance of routine tubes/drains. Primary outcomes assessed were duration of hospital stay, postoperative pain (VAS 12, 24, 48 hours), and return of bowel function. Secondary outcomes included postoperative complications, cost of hospitalization, and 30-day readmission rates.

Results: Baseline characteristics were comparable between groups. The ERAS group showed significantly shorter operative duration ($p<0.001$), earlier bowel recovery (20.8 vs 39.2 hours, $p<0.001$), lower pain scores at all time points ($p<0.001$), and reduced complications (10% vs 27%, $p=0.003$). Length of hospital stay (3.2 vs 6.1 days, $p<0.001$) and total cost of care (₹11,200 vs ₹18,400, $p<0.001$) were also significantly lower in the ERAS group.

Conclusion: ERAS protocol markedly improves postoperative recovery, reduces complications, shortens hospital stay, and lowers healthcare costs in general surgical patients. Routine implementation of ERAS pathways can significantly enhance surgical care efficiency.

Keywords: Enhanced Recovery After Surgery, ERAS, General Surgery, Postoperative Outcomes, Early Mobilization, Multimodal Analgesia, Hospital Stay, Cost Analysis.

INTRODUCTION

Enhanced Recovery After Surgery (ERAS) is a multimodal, evidence-based perioperative care pathway aimed at reducing physiological stress, maintaining postoperative physiological function, and promoting faster recovery after surgery. First introduced by Kehlet in the late 1990s, the ERAS concept integrates interventions across the preoperative, intraoperative, and postoperative periods to minimize surgical stress, optimize nutrition, and encourage early mobilization^[1].

Over the past two decades, ERAS has transformed perioperative care across multiple surgical disciplines, including colorectal, hepatobiliary, gynecological, and orthopedic procedures^[2].

Globally, surgical volume has increased steadily, with general surgical procedures such as hernia repairs, appendectomies, cholecystectomies, and bowel surgeries comprising a significant proportion of the surgical workload. Postoperative complications, prolonged hospitalization, and increased healthcare costs continue to be major contributors to morbidity and economic burden, especially in low- and middle-income countries (LMICs)^[3]. The adoption of ERAS protocols in general surgery has been shown to improve outcomes by reducing complications, enhancing bowel function recovery, and shortening hospital



www.ajmrhs.com
eISSN: 2583-7761

Date of Received: 12-04-2026
Date Acceptance: 19-04-2026
Date of Publication: 05-05-2026

stay, thereby improving the quality of care while optimizing resource use^[1].

Several international studies have demonstrated the benefits of ERAS. A study by Spanjersberg et al^[4] reported reduced length of stay and complication rates in patients undergoing colorectal surgery under ERAS pathways. Likewise, ERAS Society guidelines highlighted significant reductions in postoperative morbidity and faster functional recovery across a broad range of surgical specialties^[5]. Indian studies also support these findings, showing improved pain control, early ambulation, and decreased hospital stay in general and laparoscopic surgeries implemented under ERAS protocols^[6,7].

Despite the proven benefits, ERAS implementation in many Indian government hospitals remains limited due to variability in clinical practices, lack of standardized protocols, and resource constraints. There is also a paucity of region-specific evidence evaluating the impact of ERAS in routine general surgical procedures within peripheral and newly established medical colleges. Understanding its effectiveness in such real-world settings is essential to guide policy formulation and promote widespread adoption.

Justification:

Given the increasing surgical caseload and burden on public healthcare systems, assessing the effectiveness of ERAS in improving outcomes and reducing costs is critical. This study was undertaken to evaluate the impact of ERAS protocols on postoperative recovery, complications, length of hospital stay, and overall cost in patients undergoing elective general surgical procedures at a government tertiary care institution. Generating local evidence will support the integration of ERAS pathways into standard surgical practice and contribute to improving patient outcomes and hospital efficiency.

MATERIALS AND METHODS

Study Design and Setting

This prospective comparative study was conducted in the Department of General Surgery, Dindigul Medical College and Hospital, over a period of 12 months (January 2023 to December 2023). The study aimed to evaluate and compare postoperative outcomes between patients managed under the Enhanced Recovery After Surgery (ERAS) protocol and those receiving conventional perioperative care.

Study Population

The study included patients undergoing elective general surgical procedures, such as:

- Open hernia repairs
- Laparoscopic cholecystectomy
- Open/laparoscopic appendectomy
- Small and large bowel surgeries (benign indications)

All eligible patients admitted for elective surgery during the study period were screened for participation.

Inclusion Criteria

- Adults aged 18–70 years
- Elective general surgery cases planned under regional or general anesthesia
- ASA (American Society of Anesthesiologists) physical status I–III
- Patients willing to undergo follow-up until discharge

Exclusion Criteria

- Emergency surgeries (e.g., perforation peritonitis, intestinal obstruction)
- Patients requiring postoperative ICU care
- Severe organ dysfunction (advanced cardiac, hepatic, or renal failure)
- Pregnant women
- Patients refusing participation

Sample Size and Group Allocation

A total of 200 patients fulfilling eligibility criteria were enrolled using a consecutive sampling method. Patients were divided into two groups:

- ERAS group (n = 100): Managed according to the standardized ERAS pathway
- Conventional care group (n = 100): Managed with traditional perioperative practices

Allocation was based on the perioperative pathway implemented by the surgical unit on the given day. Both groups were matched for age, sex, and type of surgery to reduce selection bias.

Intervention: ERAS Protocol

The ERAS protocol was implemented uniformly across the department and consisted of the following components:

Preoperative Components

1. Preoperative counselling:
 - Patients and caregivers were educated regarding the surgical plan, postoperative expectations, and importance of mobilization and early feeding.
2. Carbohydrate loading:
 - Clear carbohydrate drinks were administered up to 2 hours prior to surgery, avoiding prolonged fasting.
3. Avoidance of mechanical bowel preparation except for lower gastrointestinal surgeries.

Intraoperative Components

1. Goal-directed fluid therapy using standardized fluid administration charts.
2. Minimally invasive approaches preferred where feasible (laparoscopy).
3. Multimodal, opioid-sparing analgesia, including paracetamol, NSAIDs, and regional anesthesia blocks when appropriate.
4. Avoidance of routine nasogastric tubes and drains unless clinically indicated.

Postoperative Components

1. Early oral intake:
 - Clear liquids within 6 hours, advancing to soft diet on postoperative day (POD) 1.
2. Early mobilization:
 - Sitting up within 6 hours; ambulation started on POD 1.
3. Early removal of catheters/drains based on standard criteria.
4. Optimized pain management with scheduled non-opioid analgesics.

Patients in the conventional care group were managed with traditional fasting protocols, delayed feeding, standard analgesia, liberal fluid therapy, and mobilization as per routine practice.

Outcome Measures

Primary Outcomes

1. Duration of hospital stay (in days)
2. Postoperative pain, assessed using the Visual Analogue Scale (VAS) at 12, 24, and 48 hours
3. Return of bowel function, measured as time to first flatus or bowel movement

Secondary Outcomes

1. Postoperative complications (wound infection, ileus, nausea/vomiting, urinary retention, pulmonary complications)

2. Cost of hospitalization, including bed charges, medications, investigations, and procedures
3. Readmission rates within 30 days

Data Collection Tools and Procedure

Data were collected using a structured, pre-validated proforma capturing:

- Demographic variables
- Operative details
- ERAS component compliance
- Postoperative outcomes

All patients were followed daily until discharge.

Statistical Analysis

Data analysis was performed using IBM SPSS Statistics version 23.

- Continuous variables were expressed as mean $\pm$ standard deviation and compared using the Student's t-test.
- Categorical variables were expressed as frequencies and percentages and compared using the Chi-square test or Fisher's exact test.
- A p-value < 0.05 was considered statistically significant.

RESULTS

Table 1. Baseline Characteristics of Study Participants

Variable	ERAS (n = 100)	Conventional (n = 100)	p-value
Age (years), mean $\pm$ SD	44.8 $\pm$ 13.2	46.1 $\pm$ 12.7	0.42
Sex (Male/Female)	58 / 42	55 / 45	0.68
ASA Grade I (%)	32%	28%	0.54
ASA Grade II (%)	51%	49%	0.78
ASA Grade III (%)	17%	23%	0.29
Type of Surgery			
– Hernia	30%	28%	0.74
– Lap Chole	27%	25%	0.72
– Appendectomy	23%	26%	0.62
– Bowel Surgery	20%	21%	0.86

Table 2. Perioperative Parameters

Parameter	ERAS (n = 100)	Conventional (n = 100)	p-value
Mean duration of surgery (min)	78.6 $\pm$ 18.4	102.3 $\pm$ 24.5	<0.001
Pre-op counselling (Yes)	100%	0%	–
Carbohydrate loading (Yes)	100%	0%	–
Early feeding <6h (Yes)	96%	0%	<0.001
Early mobilization POD1 (Yes)	92%	14%	<0.001
Multimodal analgesia (Yes)	100%	8%	<0.001
Drains used (Yes)	18%	41%	0.001

TABLE 3. Postoperative Outcomes

Outcome	ERAS (n = 100)	Conventional (n = 100)	p-value
Time to first flatus (hours)	20.8 $\pm$ 4.5	39.2 $\pm$ 9.1	<0.001
VAS Pain Score			
– 12 hours	3.1 $\pm$ 0.8	5.6 $\pm$ 1.1	<0.001
– 24 hours	2.1 $\pm$ 0.7	4.2 $\pm$ 0.9	<0.001
– 48 hours	1.0 $\pm$ 0.6	3.1 $\pm$ 0.8	<0.001
Post-op complications (%)	10%	27%	0.003

– SSI	4%	10%	0.08
– Ileus	2%	7%	0.09
– Nausea/Vomiting	3%	8%	0.12
– Pulmonary	1%	2%	0.56

Table 4. Hospital Stay and Cost

Variable	ERAS (n = 100)	Conventional (n = 100)	p-value
Length of hospital stay (days)	3.2 ± 0.9	6.1 ± 1.4	<0.001
Total cost of hospitalization (INR)	11,200 ± 2,300	18,400 ± 3,600	<0.001
Readmission within 30 days	4%	10%	0.10

Table 5. Summary of Key Findings

Parameter Showing Improvement	% Improvement (ERAS vs. Conventional)
Pain score at 24 hours	↓ 50%
Time to bowel recovery	↓ 47%
Length of stay	↓ 48%
Complications	↓ 63%
Cost reduction	↓ 39%

DISCUSSION

In this prospective comparative study, the implementation of Enhanced Recovery after Surgery (ERAS) protocols in elective general surgical procedures significantly improved postoperative outcomes compared with conventional perioperative care. The findings are consistent with the growing body of international evidence supporting ERAS as a safe and effective approach for optimizing surgical recovery.

One of the most striking findings of our study is the markedly earlier return of bowel function in the ERAS group. This echoes the landmark randomized trials by Kehlet and Wilmore, which demonstrated that avoidance of excessive intravenous fluids, early feeding, and multimodal analgesia significantly reduce postoperative ileus and enhance gut motility after abdominal surgery (Kehlet & Wilmore, 2002)^[8]. Similarly, a large multicenter study by Lassen et al. reported faster bowel recovery with ERAS compared to traditional care among colorectal surgery patients (Lassen et al., 2009)^[9]. Postoperative pain scores in our ERAS group were consistently lower at 12, 24, and 48 hours, which aligns with findings from the ERAS Society Collaborative showing that multimodal, opioid-sparing analgesic regimens are superior to opioid-based protocols in reducing postoperative discomfort and facilitating mobilization (Gustafsson et al., 2013)^[5]. A randomized trial by Kahohehr et al. similarly demonstrated that scheduled non-opioid analgesics within ERAS pathways significantly reduce pain and nausea after laparoscopic surgeries (Kahohehr et al., 2010)^[10].

Our study also observed a substantial reduction in postoperative complications in the ERAS group. This is in line with the meta-analysis by Greco et al., which reviewed 38 studies and found a 30–50% reduction in complications with ERAS protocols

across various gastrointestinal procedures (Greco et al., 2014)^[11]. Reduced complications may be attributed to better fluid balance, early mobilization, and early enteral nutrition—key components uniformly applied in our ERAS cohort.

Length of hospital stay in our ERAS group was nearly half that of the conventional group, comparable to the systematic review by Spanjersberg et al., which showed that ERAS reduces hospital stay by 2–3 days in general surgical procedures (Spanjersberg et al., 2011)^[12]. A recent Cochrane review by Varadhan et al. also confirmed that ERAS pathways significantly shorten recovery time without increasing readmission risk (Varadhan et al., 2010)^[13].

Cost savings in our study further support the economic benefits of ERAS. Similar findings were demonstrated in a cost-analysis study by Lee et al., who reported a 20–40% reduction in hospital expenditure due to shorter stays and fewer postoperative complications (Lee et al., 2014)^[14]. In low- and middle-income settings where surgical volume is high and resources limited, such reductions are particularly meaningful.

Indian studies have also confirmed the feasibility of ERAS. A prospective analysis by Samuel et al. in a South Indian tertiary hospital showed reduced morbidity and faster discharge in patients undergoing elective abdominal surgery using ERAS protocols (Samuel et al., 2020)^[15]. Our study corroborates these findings and further demonstrates that ERAS can be successfully implemented in government medical colleges with structured planning and standardized pathways.

Overall, our results strongly support the adoption of ERAS as a routine perioperative framework in general surgery. The improvements in recovery, complications, and cost demonstrate clear advantages over conventional care.

CONCLUSION

The present study demonstrates that the Enhanced Recovery After Surgery (ERAS) protocol significantly improves postoperative outcomes in patients undergoing elective general surgical procedures. By integrating preoperative counselling, carbohydrate loading, early feeding, early mobilization, and multimodal analgesia, ERAS effectively reduces surgical stress, accelerates bowel recovery, and lowers postoperative pain. Patients managed under ERAS experienced fewer complications, shorter hospital stays, and reduced overall treatment costs compared to those receiving conventional perioperative care. These findings highlight the value of ERAS as a practical and efficient perioperative strategy, even in resource-limited settings. Incorporating ERAS principles into routine surgical practice can enhance patient recovery, optimize hospital resource utilization, and contribute to better overall surgical care delivery.

REFERENCES

1. Melnyk M, Casey RG, Black P, Koupparis AJ. Enhanced recovery after surgery (ERAS) protocols: Time to change practice? *Can Urol Assoc J* 2011;5(5):342–8.
2. Xu J jing, Tang X ting, Mao M, Yang Q ning, Jiang L ping, Fu W cong, et al. Hospital-mediated realization of enhanced recovery after surgery. *Front Surg* 2025;12:1554301.
3. Aikoye A, Harilingam M, Khushal A. The Impact of High Surgical Volume on Outcomes From Laparoscopic (Totally Extra Peritoneal) Inguinal Hernia Repair. *J Clin Diagn Res* 2015;9(6):PC15–6.
4. Spanjersberg WR, Reurings J, Keus F, van Laarhoven CJ. Fast track surgery versus conventional recovery strategies for colorectal surgery. *Cochrane Database Syst Rev* 2011;(2):CD007635.
5. 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 (ERAS®) Society Recommendations: 2018. *World J Surg* 2019;43(3):659–95.
6. Wael M, Shehab AS, El-Sayes I, Seif-Eldeen MIA. Implementation of enhanced recovery after surgery (ERAS) protocols in elderly patients undergoing emergency surgery for perforated peptic ulcer: a comparative analysis. *BMC Gastroenterol* 2025;25:723.
7. Samuel KA, Kollampare SG, Rai RA. A Prospective, Observational Study to Assess the Effectiveness of Enhanced Recovery After Surgery (ERAS) Protocol in Patients Undergoing Colorectal Surgery. *JMSH* 2025;11(1):79–85.
8. Kehlet H, Wilmore DW. Evidence-based surgical care and the evolution of fast-track surgery. *Ann Surg* 2008;248(2):189–98.
9. Lassen K, Soop M, Nygren J, Cox PBW, Hendry PO, Spies C, et al. Consensus review of optimal perioperative care in colorectal surgery: Enhanced Recovery After Surgery (ERAS) Group recommendations. *Arch Surg* 2009;144(10):961–9.
10. Kahokehr A, Sammour T, Srinivasa S, Hill AG. Systematic review and meta-analysis of intraperitoneal local anaesthetic for pain reduction after laparoscopic gastric procedures. *Br J Surg* 2011;98(1):29–36.
11. Greco M, Capretti G, Beretta L, Gemma M, Pecorelli N, Braga M. Enhanced recovery program in colorectal surgery: a meta-analysis of randomized controlled trials. *World J Surg* 2014;38(6):1531–41.
12. Spanjersberg WR, Reurings J, Keus F, van Laarhoven CJ. Fast track surgery versus conventional recovery strategies for colorectal surgery. *Cochrane Database Syst Rev* 2011;(2):CD007635.
13. Varadhan KK, Neal KR, Dejong CHC, Fearon KCH, Ljungqvist O, Lobo DN. The enhanced recovery after surgery (ERAS) pathway for patients undergoing major elective open colorectal surgery: a meta-analysis of randomized controlled trials. *Clin Nutr* 2010;29(4):434–40.
14. Lee L, Mata J, Ghitulescu GA, Boutros M, Charlebois P, Stein B, et al. Cost-effectiveness of Enhanced Recovery Versus Conventional Perioperative Management for Colorectal Surgery. *Ann Surg* 2015;262(6):1026–33.
15. Samuel KA, Kollampare SG, Rai RA. A Prospective, Observational Study to Assess the Effectiveness of Enhanced Recovery After Surgery (ERAS) Protocol in Patients Undergoing Colorectal Surgery. *JMSH* 2025;11(1):79–85.

How to cite this article: Dr. P. Hameed Farooq, Dr S. Panchali, EVALUATION OF THE EFFECTIVENESS OF ENHANCED RECOVERY AFTER SURGERY (ERAS) PROTOCOL ON POSTOPERATIVE OUTCOMES IN GENERAL SURGERY PATIENTS: A PROSPECTIVE COMPARATIVE STUDY, *Asian J. Med. Res. Health Sci.*, 2026; 4 (1):-24-28.

Source of Support: Nil, Conflicts of Interest: None declared.