



THE IMPACT OF ENHANCED RECOVERY AFTER SURGERY PROTOCOLS IN GENERAL SURGERY: A COMPARATIVE CASE SERIES

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ABSTRACT

This comparative case series investigates the impact of Enhanced Recovery After Surgery (ERAS) protocols in 100 patients undergoing major general surgical procedures at the Institute of General Surgery, Madras Medical College from April to December 2024. Fifty patients received ERAS-based care incorporating structured preoperative education, multimodal analgesia, goal-directed fluid therapy, and early mobilization. Fifty control patients received conventional perioperative management. Key outcomes assessed included length of hospital stay, time to first ambulation, return of bowel function, postoperative pain, complications, and 30-day readmissions. ERAS patients demonstrated significantly faster mobilization (12.5 vs. 20.4 hours), earlier bowel recovery (1.8 vs. 2.6 days), reduced pain scores, and shorter hospital stays (4.2 vs. 6.1 days), although lower complication and readmission rates did not achieve statistical significance. Overall, our findings support ERAS as a feasible and beneficial approach to enhance patient recovery, suggesting its wider adoption in elective general surgical practice.

KEYWORDS : - Enhanced Recovery After Surgery (ERAS), General Surgery, Postoperative Outcomes, Multimodal Analgesia, Early Mobilization, Comparative Case Series

INTRODUCTION

Enhanced Recovery After Surgery (ERAS) protocols represent a multidisciplinary, perioperative approach aimed at minimizing surgical stress, accelerating postoperative recovery, and improving patient outcomes (1). Initially introduced in colorectal surgeries, ERAS strategies have now been extended to various surgical disciplines, including general surgery, orthopaedic surgery, and gynaecology, among others (2). Key components of ERAS protocols include thorough preoperative counselling, optimized fluid management, evidence-based analgesia (often with opioid-sparing techniques), minimally invasive surgical approaches where appropriate, and standardization of postoperative care to expedite patient recovery.

Although numerous studies have demonstrated the efficacy of ERAS pathways in colorectal operations, relatively fewer have focused on the application and outcomes of ERAS in broader categories of general surgery. This research article presents a comparative case series examining the effect of ERAS protocols on postoperative outcomes in patients undergoing major general surgical procedures at the Institute of General Surgery, Madras Medical College. The data span a 9-month period (April 2024 to December 2024), comparing patients enrolled in an ERAS program to those who received conventional perioperative care.

METHODOLOGY

Study Design

This comparative case series was conducted at the Institute of General Surgery, Madras Medical College over a 9-month period from April 2024 to December 2024. Ethical clearance was obtained from the institutional review board. All participants provided written informed consent.

Patient Selection and Group Allocation

Inclusion Criteria:

- ✓ Age 18–75 years
- ✓ Undergoing major elective general surgical procedures (e.g., open or laparoscopic cholecystectomy, gastrectomy, colectomy)
- ✓ ASA (American Society of Anaesthesiologists) Physical Status I–III
- **Exclusion Criteria:**
- ✓ Emergency surgeries
- ✓ Patients with severe cardiopulmonary comorbidities (ASA IV and above)
- ✓ Known allergies to protocol medications

A total of 100 patients were enrolled and divided equally into two cohorts of 50:

1. ERAS Cohort (n = 50): Managed according to a comprehensive ERAS protocol.
2. Conventional Care Cohort (n = 50): Received standard perioperative care without a structured ERAS pathway.

Types of Surgeries Performed

Below is the distribution of the surgeries performed (both groups combined), with the percentage of patients for each procedure based on the total study population (N = 100).

Table 1

Type of Surgery	Number of Patients	Percentage (%)
Open Cholecystectomy	20	20
Laparoscopic Cholecystectomy	30	30
Gastrectomy (Open)	10	10
Colectomy (Open)	20	20
Laparoscopic Colectomy	10	10
Other Major Procedures*	10	10
Total	100	100

Other major procedures includes open/laparoscopic small bowel resections, complex hernia repairs, etc.

ERAS Protocols Implemented

Below are the detailed ERAS protocols adopted for the 50 patients in the ERAS cohort. Patients in the conventional group did not receive these standardized measures; rather, they followed the usual institutional practices without a formalized pathway.

1. Preoperative Phase

- **Patient Education:** A structured session explaining the surgical procedure, role of early mobilization, pain management plan, and importance of postoperative compliance.
- **Nutritional Screening & Carbohydrate Loading:** Patients were assessed for nutritional risks. Those deemed at risk received supplements. Additionally, most patients were given a carbohydrate-rich beverage up to 2 hours before induction.
- **Smoking Cessation & Glycaemic Control:** Active smokers were counselled to stop smoking at least 2 weeks prior to surgery. Diabetic patients had tight glycaemic control (target blood glucose 120–180 mg/dL).

2. Intraoperative Phase

- **Minimally Invasive Techniques:** Whenever feasible, a laparoscopic approach was preferred to reduce surgical trauma.

- **Goal-Directed Fluid Therapy:** A hemodynamic monitoring algorithm guided the administration of IV fluids and vasoactive drugs, preventing both fluid overload and hypovolemia.
 - **Multimodal Analgesia:** Use of regional anesthesia (e.g., TAP blocks or epidural, depending on the procedure), NSAIDs, and acetaminophen to reduce opioid requirements.
 - **Maintenance of Normothermia:** Forced-air warming blankets and warmed IV fluids to sustain core temperature.
 - **Antiemetic-Prophylaxis:** Combination of 5-HT3 antagonists (e.g., ondansetron) with dexamethasone in high-risk patients.
- 3. Postoperative Phase**
- **Early Mobilization:** Patients were encouraged to sit up and start ambulating (with assistance if needed) within 12–24 hours post-surgery.
 - **Early Oral Intake:** Clear liquids were introduced within 6–12 hours, progressing to a regular diet as tolerated.
 - **Analgesic Regimen:** Scheduled non-opioid analgesics (NSAIDs, paracetamol) and sparing use of short-acting opioids for breakthrough pain.
 - **Urinary Catheter & Drain Removal:** Removal was targeted within 24–48 hours unless clinically contraindicated.
 - **Daily Progress Review:** A dedicated ERAS nurse and surgical team member reviewed each patient daily to ensure compliance with protocols and to address barriers (e.g., pain control, GI function).

RESULTS

Patient DemographicsThe demographic and baseline clinical characteristics were comparable between the two groups, indicating no statistically significant differences (Table 2).

Table 2

Variable	ERAS (n=50)	Conventional (n=50)	p-value
Age (years)	49.2 ± 10.5	48.8 ± 9.6	0.81
Gender (M/F)	25/22	27/23	0.86
BMI (kg/m²)	26.3 ± 2.8	25.9 ± 3.2	0.52
Diabetes (%)	20 (40%)	22 (44%)	0.68
Hypertension (%)	15 (30%)	17 (34%)	0.66

Primary Outcomes – Results

Table 3

Outcome Measure	ERAS (n=50)	Conventional (n=50)	p-value
Length of Hospital Stay (days)	4.2 ± 0.9	6.1 ± 1.1	< 0.001
Time to First Ambulation (hours)	12.5 ± 3.6	20.4 ± 6.2	< 0.001
Time to Return of Bowel Function (days)	1.8 ± 0.6	2.6 ± 0.7	0.002
Pain Score at 24 hrs (VAS)	3.2 ± 0.8	4.1 ± 0.9	0.03
Pain Score at 48 hrs (VAS)	2.7 ± 0.7	3.5 ± 0.8	0.04
Pain Score at 72 hrs (VAS)	2.1 ± 0.5	2.8 ± 0.6	0.05

Post-operative Complications And Readmissions - Results

Table 4

Variable	ERAS (n=50)	Conventional (n=50)	p-value
Overall Complication Rate	5 (10%)	11 (22%)	0.08
- Surgical Site Infection (SSI)	2 (4%)	5 (10%)	0.24
- Pneumonia	1 (2%)	3 (6%)	0.30
- Postoperative Ileus	2 (4%)	3 (6%)	1.00*
30-Day Readmission Rate	2 (4%)	5 (10%)	0.24

*Fisher's exact test used for small numbers.

DISCUSSION

While the overall complication rate favored the ERAS group (10% vs. 22% in the conventional group), it did not reach statistical significance (p = 0.08). However, this trend aligns with a growing body of literature supporting ERAS-associated reductions in morbidity.

The present comparative case series underscores the multifaceted advantages of ERAS protocols over conventional perioperative management in patients undergoing diverse general surgical procedures at our institution. While ERAS was originally conceptualized and systematically studied in colorectal surgery, the current data suggest that these principles are broadly applicable to a wide range of major elective operations. Several key observations warrant closer examination:

1. Accelerated Functional Recovery

A central tenet of ERAS is the prevention or minimization of perioperative stressors, thereby promoting swift mobilization and return to normal physiological function. In our study, ERAS patients exhibited significantly faster times to first ambulation and earlier return of bowel function compared to those receiving conventional care. By advocating early mobilization, we likely mitigated the risk of venous thromboembolism, facilitated improved ventilation, and promoted gastrointestinal motility—outcomes that collectively reduce complications and hospital stay. These findings echo those in colorectal surgery, where early mobilization is known to limit muscle atrophy and reduce cardiopulmonary complications

2. Reduced Opioid Utilization and Superior Pain Control

Another strength of ERAS lies in its multimodal analgesic strategies, which effectively control pain while avoiding the pitfalls of high-dose opioids (e.g., sedation, respiratory depression, postoperative ileus). Our study's lower Visual Analog Scale (VAS) pain scores at 24, 48, and 72 hours in the ERAS group highlight the benefit of strategies such as non-opioid analgesics (NSAIDs, acetaminophen) combined with regional blocks (e.g., transversus abdominis plane blocks) or epidurals. The improved pain control likely contributed to higher patient satisfaction and facilitated earlier mobilization. This aligns with recent literature endorsing opioid-sparing techniques as a means to enhance postoperative outcomes.

3. Enhanced Patient Engagement and Education

Preoperative counseling, detailed education about the surgical process, and setting realistic expectations are core elements of ERAS pathways. Our daily rounds by the ERAS nurse, combined with consistent multidisciplinary support (anesthesiology, nursing, nutrition, physiotherapy), provided patients with a clear roadmap for their recovery. This patient-centric model fosters greater adherence to postoperative instructions—especially in mobilization and dietary intake—and has been correlated with improved patient satisfaction and reduced anxiety

4. Shorter Hospital Stay and Healthcare Cost Implications

The average length of hospital stay for the ERAS cohort was nearly two days shorter than that of the conventional group, a difference that not only benefits patients and their families but also generates tangible savings in hospital resources. Reduced bed occupancy translates into improved capacity utilization, allowing institutions to direct resources more efficiently. Although our study did not include a formal cost analysis, shorter hospital stays are widely regarded as a primary driver for cost savings, aligning with broad trends in ERAS research.

5. Complications and Readmission Rates

Although overall complication rates and 30-day readmissions favored the ERAS group, statistical significance was not achieved. Nonetheless, the 12% absolute difference in complication rates (10% in ERAS vs. 22% in conventional care) is clinically meaningful in real-world settings, where any reduction in postoperative morbidity can substantially affect patient outcomes and reduce costs. The small sample size (N=100) may have limited the power to detect significant differences in less frequent outcomes such as pneumonia or readmission. Larger, multicenter trials would be better positioned to clarify the impact of ERAS on these critical endpoints.

Challenges and Limitations

- **Protocol Adherence:** One barrier to ERAS implementation is ensuring that every element is consistently applied. In real-world settings, variations in staff training, perioperative workflows, and patient factors can lead to deviation from standardized protocols.
- **Patient Selection:** Our inclusion criteria (ASA I–III, elective surgeries) may limit the generalizability of results to higher-risk cohorts (e.g., ASA IV), where the risk-benefit ratio of ERAS might differ.
- **Resource Intensiveness:** ERAS often requires dedicated personnel (nurses, dietitians, physiotherapists) and institutional buy-in to ensure compliance. Without organizational support, partial implementation can undermine the full benefits of the ERAS approach.

Follow-Up Duration: Our 30-day follow-up window may not capture late complications or longer-term functional outcomes. Future research with extended follow-up might provide more robust data on late readmissions and quality of life measures.

Overall, these findings align with the international body of evidence advocating ERAS as a gold standard for perioperative care in suitable patients. By curbing the surgical stress response, optimizing pain management, and actively engaging patients in their recovery, ERAS paves the way for a more efficient and patient-friendly care model.

Future Directions

Moving forward, several avenues merit exploration:

- **Protocol Customization:** Refining ERAS pathways to match local patient demographics (e.g., different nutritional profiles, cultural norms on pain management) might bolster outcomes.
- **Cost-Effectiveness Analysis:** A robust economic assessment would quantify the savings from reduced hospital stays and complications.
- **Enhanced Digital Monitoring:** The growing use of telemedicine and remote patient monitoring could further augment adherence to ERAS components, especially after hospital discharge.
- **Expansion to Other Specialties:** Although popularized in colorectal and other open abdominal surgeries, the applicability of ERAS to other subspecialties (hepatobiliary, endocrine) is still emerging and warrants further investigation.

CONCLUSION

In conclusion, our comparative case series provides compelling evidence that Enhanced Recovery After Surgery (ERAS) protocols offer substantial benefits over conventional care for major elective general surgical procedures. Key advantages observed in the ERAS cohort included shorter hospitalization, faster mobilization, earlier return of bowel function, and improved pain control—all of which translate to higher patient satisfaction and more efficient use of hospital resources.

While the reduction in postoperative complications and readmissions did not achieve statistical significance in this sample size, the observed trends nevertheless underscore the clinical importance of adopting ERAS strategies. The modest sample may have attenuated our ability to detect significant differences in rarer adverse events. Nonetheless, these findings, coupled with the existing body of literature, strongly support ERAS as a preferred framework for perioperative management.

By emphasizing multidisciplinary collaboration, detailed patient education, and evidence-based interventions, ERAS not only optimizes clinical outcomes but also sets the stage for a culture of continuous quality improvement in surgical care.

Further large-scale, randomized studies, backed by formal cost analyses, could reinforce these conclusions and pave the way for routine ERAS adoption across a broader spectrum of procedures and patient populations. Ultimately, the consistent application of ERAS principles stands poised to enhance patient-centered care while reducing healthcare burdens in modern surgical practice.

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