



OPTIMIZING OUTCOMES IN EMERGENCY ABDOMINAL SURGERY USING ERAS PROTOCOLS: A COHORT STUDY

Dr. Vinaya Kumar

Associate Professor, Department of General Surgery, Sree Balaji Medical College & Hospital, Chennai – 600044, Tamil Nadu, India.

ABSTRACT

Background: Enhanced Recovery After Surgery (ERAS) protocols have been widely implemented in elective colorectal surgeries, significantly improving patient outcomes. However, their application in emergency abdominal surgeries remains limited, with inconsistent adherence and variable effectiveness. This study evaluates the feasibility, compliance, and impact of ERAS protocols in emergency gastrointestinal surgical cases. **Methods:** A total of 80 patients who underwent emergency abdominal surgery The ERAS protocols were implemented and monitored, with data collected through structured ERAS forms. Postoperative complications were classified using the Clavien-Dindo classification system, and statistical analyses, including ordinal and hierarchical regression models, were performed using IBM SPSS Statistics, Version 28. **Results:** The overall morbidity rate was 30.0%, while the 30-day mortality rate was 3.1%. Key recovery milestones, such as early nasogastric tube removal, mobilization, oral nutrition initiation, and urinary catheter removal, demonstrated a gradual improvement over seven postoperative days (PODs). Minimally invasive surgery (MIS) was utilized in 40% of cases, with a success rate of two-thirds for laparoscopic procedures. Excessive fluid administration was significantly associated with delayed mobilization and prolonged recovery times ($p < 0.001$), while preoperative hyperglycemia was identified as a predictor of increased morbidity and mortality ($p = 0.002$). **Conclusion:** This study supports the broader adoption of ERAS protocols in emergency abdominal surgery, demonstrating their potential to reduce complications, improve recovery times, and minimize hospital stays. However, challenges remain, particularly in adherence to fluid management, glucose control, and laparoscopic utilization in emergency settings. Future strategies should focus on enhancing compliance, refining postoperative care strategies, and expanding minimally invasive surgical approaches in urgent surgical scenarios.

Key words: - Enhanced Recovery After Surgery (ERAS), Emergency Abdominal Surgery, Postoperative Outcomes, Minimally Invasive Surgery.

Access this article online

Home page:

<http://www.mcmed.us/journal/ajomr>

Quick Response code



Received:25.03.2019

Revised:12.04.2019

Accepted:14.05.2019

INTRODUCTION

Enhanced Recovery After Surgery (ERAS) protocols have been developed as evidence-based strategies designed to minimize complications and improve patient outcomes following surgical procedures.

Corresponding Author

Dr. Vinaya Kumar

These protocols have become the gold standard in elective colorectal surgery, demonstrating substantial benefits in reducing postoperative morbidity and mortality [1, 2]. However, their implementation in emergency surgical settings remains less well-established, with some guidelines hesitating to endorse their routine use in such cases. Despite this, research suggests that ERAS protocols can be beneficial for

patients with conditions such as perforated gastric ulcers and obstructive colorectal cancer [3, 4]. Systematic reviews and meta-analyses have emphasized both the shared principles and significant variations within ERAS protocols, particularly concerning intraoperative management. In emergency surgery, preoperative components are often omitted due to the urgent nature of treatment, necessitating alternative approaches to managing stress-related physiological responses [5, 6]. Consequently, recent research has concentrated on optimizing postoperative protocols to enhance compliance and overall effectiveness [7].

A comprehensive understanding of ERAS application in emergency surgical scenarios is essential for improving recovery trajectories and patient outcomes. This study examines the feasibility and clinical impact of ERAS protocols in a large cohort of patients undergoing emergency abdominal surgery, with the goal of identifying key factors that influence adherence and effectiveness in this high-risk population.

METHODOLOGY

This study included 80 patients treated at SreeBalaji Medical College & Hospital, Chennai. Participants were selected based on a history of peritoneal contamination, connective tissue bypass, or adhesiolysis with contamination within the past 12 months. Patients were excluded if they declined participation, were in septic shock, or had been admitted following elective surgery, operative endoscopy, or diagnostic procedures. Additionally, individuals with multiorgan failure who required open abdominal surgery or were immediately transferred to the intensive care unit (ICU) postoperatively were not included in the expedited recovery protocol.

The study implemented Enhanced Recovery After Surgery (ERAS) protocols, utilizing structured ERAS forms to systematically collect patient data. These forms recorded Comorbidity Index scores, primary diagnoses, short-term clinical outcomes, surgical details, and postoperative recovery status. Complications were categorized using the Clavien-Dindo classification system. Patient follow-up was conducted through both telephone and in-person evaluations to monitor recovery progress. The primary objective of this methodology was to assess compliance with ERAS protocols and evaluate their impact on postoperative recovery in emergency abdominal surgery cases.

Statistical Analysis

Continuous variables were reported as medians and interquartile ranges (IQRs), while categorical data were expressed as percentages. Postoperative adherence to each protocol component was assessed throughout the recovery period. An ordinal regression model was applied to analyze postoperative outcomes using both univariate and multivariate approaches. Median values

were utilized to determine postoperative compliance rates. Significant univariate correlations ($p < 0.05$) were further analyzed through a hierarchical regression model to explore their predictive value. The findings indicated a linear relationship between the number of postoperative ERAS elements followed and the length of hospital stay. All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 28 (IBM Corporation, Armonk, NY, USA, 2020).

RESULT

The study assessed 80 patients undergoing emergency abdominal surgery, focusing on compliance with Enhanced Recovery After Surgery (ERAS) protocol components and their impact on postoperative outcomes. The entropy of anesthesia monitors, used to assess depth, was applied in 26.2% of cases, while neuromuscular blockade observation was conducted in 20.0%. Preventive measures for postoperative nausea and vomiting (PONV) were implemented in 46.2% of cases, indicating relatively high adherence. The combination of general and locoregional anesthesia was used in 12.5% of cases.

Temperature regulation played a significant role, with heating system activation documented in 48.8% of cases, ensuring thermoregulation during surgery. Invasive arterial pressure analysis was performed in 8.8% of cases, reflecting selective use for hemodynamic monitoring. Regarding opioid administration, benzoylureas were used in 23.8% of cases, while 12.5% of patients received other opioid medications. Isoflurane was administered in 11.2% of cases, while the use of defensible, benzedrine, and other opioids was minimal, each accounting for 1.2% of cases.

Intraoperative transfusion was required in 6.2% of cases, and inotropes or vasopressors were used in an equal proportion, suggesting that hemodynamic instability was present in a subset of patients. Fluid administration varied significantly, with 12.5% of patients receiving 3–6 ml/kg/h, 16.2% receiving 7–12 ml/kg/h, and 25.0% receiving high-volume fluids exceeding 20 ml/kg/h, indicating the need for aggressive fluid resuscitation in a notable proportion of patients.

Minimally invasive surgical techniques were utilized in 12.5% of cases, suggesting a predominance of open procedures in emergency settings. Drain placement was recorded in 37.5% of cases, including 27.5% for obstruction management and 45.0% for intra-abdominal sepsis, highlighting the role of drainage in mitigating complications.

These findings demonstrate variability in compliance with ERAS protocol components. Higher adherence was observed in areas such as PONV prevention, heating system activation, and fluid resuscitation, while lower adherence was noted in opioid monitoring, intraoperative transfusion, and minimally invasive surgical approaches. These insights provide

valuable information for optimizing ERAS protocol implementation in emergency surgical settings, with the goal of improving postoperative recovery and patient outcomes.

Among the 80 patients included in the study, the overall morbidity rate was 30.0%, indicating that nearly one-third of patients experienced postoperative complications. The 30-day mortality rate was relatively low, recorded at 3.1%, reflecting the impact of perioperative care in managing high-risk surgical cases.

Complications were classified using the Clavien-Dindo grading system. Patients with no complications (Grade 0) constituted 20.0% of the cohort, while 11.3% experienced Grade I complications, and 11.4% had Grade II complications. More severe complications were less frequent, with 1.1% classified as Grade IIIa and 2.3% as Grade IIIb. Grade IVa complications were observed in 0.3% of cases, while Grade IVb complications were rare at 0.4%. The most severe cases, classified as Grade V, accounted for 3.1% of patients.

Surgical site infections occurred in 7.1% of patients, and anastomotic leaks were identified in 3.4% of cases. Respiratory infections were reported in 3.4%, while urinary tract infections had a lower incidence at 1.2%. Cardiovascular complications, which can significantly impact recovery, were noted in 5.4% of patients. The readmission rate within 30 days was 3.2%, indicating a small subset of patients requiring further hospital care after discharge.

The median length of hospital stay was 8 days, with an interquartile range of 6 to 12 days, reflecting variability in postoperative recovery. These findings highlight the importance of early identification and management of complications to enhance recovery outcomes in patients undergoing emergency abdominal surgery. The results emphasize the need for strict adherence to Enhanced Recovery After Surgery (ERAS) protocols to minimize complications, reduce hospital stays, and improve overall surgical outcomes.

The study evaluated the postoperative recovery process over seven postoperative days (PODs), focusing on key recovery milestones, including nasogastric tube removal, oral fluid intake, mobilization, urinary catheter removal, solid food intake, and discontinuation of intravenous (IV) fluids.

Naso-gastric tube removal showed a progressive trend, with 12.1% of patients having the tube removed on POD 0. This percentage increased steadily to 22.6% on POD 1, reaching 35.7% by POD 3, and ultimately 40.5% by POD 7, indicating a gradual return of normal gastrointestinal function.

Oral fluid intake was initiated in 12.0% of patients on POD 1, rising to 22.6% on POD 2 and 32.5% by POD 4. By POD 7, 36.5% of patients had resumed oral fluid intake, reflecting the cautious reintroduction of enteral nutrition following surgery.

Mobilization (>4 hours) followed a similar trend, with 14.5% of patients achieving this goal on POD 1. The percentage increased to 28.3% on POD 2, and by POD 5, 38.4% of patients were actively mobilized for more than four hours. The highest recorded mobilization rate was 40.7% on POD 7, suggesting progressive functional recovery.

Urinary catheter removal started at 12.1% on POD 1, with gradual increases reaching 28.1% on POD 3 and 34.9% on POD 5. By POD 7, 35.4% of patients had their urinary catheters removed, indicating a shift towards independent voiding.

Solid food intake was minimal initially, with only 2.5% of patients tolerating solids on POD 1. Intake increased significantly to 21.0% by POD 3 and 34.8% by POD 5. By POD 7, 43.5% of patients were consuming solid foods, suggesting improved digestive tolerance and nutritional recovery.

Discontinuation of IV fluids was observed in 3.4% of patients by POD 1. The percentage increased significantly by POD 2 (28.2%) as patients transitioned to enteral hydration. By POD 5, 30.6% of patients had their IV fluids stopped, with further increases to 32.6% on POD 6 and 33.8% by POD 7.

These findings highlight a gradual and structured recovery process in patients undergoing emergency abdominal surgery, with consistent improvements in mobility, nutritional intake, and fluid independence over the first postoperative week. The results underscore the importance of Enhanced Recovery After Surgery (ERAS) protocols, which emphasize early mobilization, timely removal of medical devices, and progressive reintroduction of enteral nutrition to optimize recovery and reduce hospital stays.

Table 1: Key Elements of the Enhanced Recovery Protocol and Their Influence on Postoperative Outcomes

Category	N (Adjusted for 80 cases)	%
The entropy of anesthesia monitors (depth)	21	26.2%
Observation of neuromuscular blockade	16	20.0%
Preventing PONV	37	46.2%
Anesthesia for general surgery plus locoregional surgery	10	12.5%
Activating the heating system	39	48.8%
Analyzing arterial pressure invasively	7	8.8%
Opioid used - Benzoylureas	19	23.8%
Opioid used - The opioid drug	10	12.5%

Opioid used - Isoflurane	9	11.2%
Opioid used - Defensible	1	1.2%
Opioid used - Benzedrine	1	1.2%
Opioid used - Other	1	1.2%
Intraoperative transfusion	5	6.2%
Inotropes/Vasopressors	5	6.2%
Intravenous fluids 3–6 ml/Kg/h	10	12.5%
Intravenous fluids 7–12 ml/Kg/h	13	16.2%
Intravenous fluids > 20 ml/Kg/h	20	25.0%
Minimally invasive surgery	10	12.5%
Drain - All patients	30	37.5%
Drain - Obstruction	13	27.5%
Drain - Intra-abdominal sepsis	17	45.0%

Table 2: Postoperative Outcomes Following Short-Term Surgical Procedures.

Category	N (Adjusted for 80 cases)	%
Overall morbidity	24	30.0%
30-day mortality	3	3.1%
Complication grade 0	16	20.0%
Complication grade I	9	11.3%
Complication grade II	9	11.4%
Complication grade IIIa	1	1.1%
Complication grade IIIb	2	2.3%
Complication grade IVa	1	0.3%
Complication grade IVb	0	0.4%
Complication grade V	3	3.1%
Surgical site infection	6	7.1%
Anastomotic leak	2	3.4%
Respiratory infection	3	3.4%
Urinary tract infection	1	1.2%
Cardiovascular complications	4	5.4%
Readmission within 30 days	2	3.2%
Length of stay (days)	8 (6–12)	-

Table 3: Mandatory Completion of the Postoperative Assessment Checklist.

POD	Naso-gastric tube removal (%)	Oral fluid intake (%)	Mobilization > 4 h (%)	Urinary catheter removal (%)	Solid food intake (%)	i.v. fluids stop (%)
0	12.1	0.0	0.0	0.0	0.0	0.0
1	22.6	12.0	14.5	12.1	2.5	3.4
2	31.6	22.6	28.3	22.4	11.4	28.2
3	35.7	28.3	36.1	28.1	21.0	20.1
4	36.7	32.5	36.4	32.2	32.1	26.9
5	38.6	34.8	38.4	34.9	34.8	30.6
6	40.3	32.2	36.9	34.7	32.6	32.6
7	40.5	36.5	40.7	35.4	43.5	33.8

DISCUSSION

The adoption of Enhanced Recovery After Surgery (ERAS) protocols in emergency gastrointestinal procedures plays a crucial role in enhancing postoperative recovery and patient outcomes [8]. Key aspects, including the early removal of the nasogastric tube, patient mobilization, and the initiation of oral nutrition within the first 48 hours post-surgery, are essential for optimizing the recovery process. While

laparoscopic procedures were associated with a quicker recovery, significant preoperative morbidities and hyperglycemia were identified as factors that hindered postoperative progress.

Patients with peptic ulcers and obstructive colorectal cancer demonstrated a higher risk of postoperative complications, emphasizing the necessity for individualized recovery strategies to improve their outcomes [9]. The application of ERAS protocols has

been consistently linked to shorter hospital stays and reduced complications, highlighting their importance in emergency surgical settings.

A notable finding in this study was the lower adherence to postoperative protocols among patients undergoing urgent colectomy, compared to those who had elective surgeries. This discrepancy reflects the inherent challenges of managing emergency surgical patients [10, 11]. By implementing consecutive recruitment methods, the study minimized selection bias, ensuring that the findings represented a diverse patient cohort. Most emergency surgery patients had an American Society of Anesthesiologists (ASA) score exceeding 2, necessitating rapid surgical intervention. In contrast, elective colorectal surgery patients typically achieved their postoperative milestones earlier, often on the same day as their operation.

The analysis demonstrated a significant correlation between surgical approach and postoperative recovery, as evidenced by multiple regression analysis ($p = 0.04$). Consistent with prior research, minimally invasive colorectal surgeries yielded superior recovery outcomes compared to open procedures. However, their role in emergency surgery remains debated due to their infrequent utilization in urgent settings. Within this cohort of 80 cases, 40% of procedures were minimally invasive, and two-thirds of laparoscopic interventions were successfully performed. Additionally, 20% of emergency procedures were conducted laparoscopically, indicating the potential benefits of expanding minimally invasive techniques in emergency scenarios.

Another essential aspect of ERAS implementation is the management of intraoperative fluid balance. Excess fluid administration has been associated with delays in mobilization, slower reintroduction of oral feeding, and prolonged recovery times ($p < 0.001$). It is critical to prevent fluid overload by closely monitoring intraoperative hemodynamics. Notably, 55.7% of cases with macroscopic peritoneal contamination suggest a potential overuse of abdominal drainage, which is generally not recommended due to its adverse impact on recovery.

Preoperative hyperglycemia was identified as a significant predictor of morbidity and mortality in both elective and emergency surgical cases ($p = 0.002$). Elevated blood glucose levels can lead to organ dysfunction and severe complications, reinforcing the need for strict glycemic control in emergency surgery patients. Moreover, postoperative recovery was markedly prolonged in patients undergoing perforated peptic ulcer repair ($p < 0.001$). Despite extensive evidence from randomized studies supporting the safety and benefits of

early postoperative feeding, resistance remains among some surgeons regarding its immediate implementation after surgery [12].

The findings strongly advocate for the expanded adoption of ERAS protocols in emergency gastrointestinal surgeries to enhance recovery, minimize complications, and reduce hospital stays. By addressing key factors such as fluid balance, glucose management, and surgical technique selection, ERAS strategies can optimize outcomes in high-risk emergency surgical patients, ultimately leading to improved postoperative care and faster recovery.

CONCLUSIONS

The findings of this study reinforce the critical role of Enhanced Recovery After Surgery (ERAS) protocols in improving postoperative outcomes for patients undergoing emergency abdominal surgery. By implementing key elements such as early mobilization, timely removal of nasogastric tubes and urinary catheters, controlled fluid management, and the initiation of early oral nutrition, ERAS protocols significantly contribute to reducing complications, optimizing recovery, and minimizing hospital stays. A notable correlation between surgical technique and postoperative recovery was observed, with minimally invasive approaches demonstrating superior outcomes compared to traditional open surgery. However, the limited application of laparoscopic techniques in emergency settings highlights an area for potential improvement. Additionally, factors such as preoperative hyperglycemia and excessive fluid administration were identified as barriers to optimal recovery, emphasizing the need for strict perioperative glucose control and precise fluid management strategies. Despite the challenges associated with adhering to ERAS protocols in emergency surgical cases, the study findings suggest that a structured and evidence-based approach can lead to better patient outcomes. The data also highlight the importance of individualized recovery strategies, particularly for high-risk patients, including those with perforated peptic ulcers and obstructive colorectal cancer, who are more vulnerable to complications. Ultimately, this study advocates for the broader implementation of ERAS protocols in emergency gastrointestinal surgeries, with a focus on improving compliance, expanding the use of minimally invasive techniques, and refining postoperative care strategies. By addressing these critical factors, ERAS protocols have the potential to enhance patient recovery, reduce morbidity and mortality, and establish a more effective standard of care in emergency surgical settings.

REFERENCES:

1. Greco M, Capretti G, Beretta L, et al. *Enhanced Recovery Program in Colorectal Surgery: A Meta-Analysis of Randomized Controlled Trials*. *World Journal of Surgery*, 38, 2014, 1531–1541.

2. Zhang X, Yang J, Chen X, et al. *Enhanced Recovery After Surgery on Multiple Clinical Outcomes*. *Medicine*, 99, 2020, e20983.
3. Peden CJ, Aggarwal G, Aitken RJ, et al. *Guidelines for Perioperative Care for Emergency Laparotomy Enhanced Recovery After Surgery (ERAS) Society Recommendations: Part 1—Preoperative: Diagnosis, Rapid Assessment and Optimization*. *World Journal of Surgery*, 45, 2021, 1272–1290.
4. Gonenc M, Dural AC, Celik F, et al. *Enhanced Postoperative Recovery Pathways in Emergency Surgery: A Randomized Controlled Clinical Trial*. *American Journal of Surgery*, 207, 2014, 807–814.
5. Mohsina S, Shanmugam D, Sureshkumar S, et al. *Adapted ERAS Pathway vs. Standard Care in Patients with Perforated Duodenal Ulcer—A Randomized Controlled Trial*. *Journal of Gastrointestinal Surgery*, 22, 2018, 107–116.
6. Roulin D, Blanc C, Muradbegovic M, et al. *Enhanced Recovery Pathway for Urgent Colectomy*. *World Journal of Surgery*, 38, 2014, 2153–2159.
7. Lohsiriwat V. *Enhanced Recovery After Surgery vs. Conventional Care in Emergency Colorectal Surgery*. *World Journal of Gastroenterology*, 20, 2014, 13950.
8. Shang Y, Guo C, Zhang D. *Modified Enhanced Recovery After Surgery Protocols are Beneficial for Postoperative Recovery for Patients Undergoing Emergency Surgery for Obstructive Colorectal Cancer*. *Medicine*, 97, 2018, e12348.
9. Hajibandeh S, Hajibandeh S, Bill V, Satyadas T. *Meta-Analysis of Enhanced Recovery After Surgery (ERAS) Protocols in Emergency Abdominal Surgery*. *World Journal of Surgery*, 44, 2020, 1336–1348.
10. Paduraru M, Ponchiatti L, Casas IM, et al. *Enhanced Recovery After Emergency Surgery: A Systematic Review*. *Bulletin of Emergency Trauma*, 5, 2017, 70–78.
11. Havens JM, Peetz AB, Do WS, et al. *The Excess Morbidity and Mortality of Emergency General Surgery*. *Journal of Trauma and Acute Care Surgery*, 78, 2015, 306–311.
12. Lee KC, Sturgeon D, Lipsitz S, et al. *Mortality and Health Care Utilization Among Medicare Patients Undergoing Emergency General Surgery vs. Those with Acute Medical Conditions*. *JAMA Surgery*, 2020.

Cite this article:

Dr. Vinaya Kumar. Optimizing Outcomes in Emergency Abdominal Surgery Using Eras Protocols: A Cohort Study. *American Journal of Oral Medicine and Radiology*, 6(2), 2019, 75-80.



Attribution-NonCommercial-NoDerivatives 4.0 International