Section: General Surgery

Original Research Article

EVALUATING THE IMPACT OF ENHANCED RECOVERY AFTER SURGERY (ERAS) PROTOCOLS ON POSTOPERATIVE OUTCOMES IN COMPLEX GASTROINTESTINAL SURGERIES

Puli Vineela[1], M Aparna[2], B Raghavender[3]

[1]Assistant Professor, Department of General Surgery, Government Medical College and Hospital, Jayashankar Bhupalpally, Telangana, India
[2]Associate Professor, Department of General Surgery, Osmania Medical College and Hospital, Hyderabad, Telangana, India
[3]Civil Assistant Surgeon, Government General Hospital, Narayanpet, Telangana, India

Received : 21/12/2024
Received in revised form : 12/02/2025
Accepted : 27/02/2025

Keywords:
Enhanced Recovery After Surgery, ERAS, Gastrointestinal Surgery, Postoperative Outcomes, Perioperative Care, Complication Rates, Hospital Stay, Multimodal Analgesia.

Corresponding Author:
Dr. Puli Vineela,
Email: pulivineela@gmail.com

DOI: 10.47009/jamp.2025.7.1.192

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (1); 982-987

Abstract

Background: Enhanced Recovery After Surgery (ERAS) protocols have revolutionized perioperative care by integrating evidence-based strategies to optimize patient recovery, reduce complications, and shorten hospital stays. These protocols focus on multimodal interventions, including preoperative optimization, intraoperative management, and postoperative rehabilitation. In complex gastrointestinal (GI) surgeries, where postoperative morbidity is significant, ERAS protocols aim to enhance functional recovery and improve clinical outcomes. However, the real-world effectiveness of ERAS in complex GI procedures remains an area of ongoing evaluation, particularly in settings with variable adherence to protocolized care. This study aims to evaluate the efficacy of ERAS protocols in patients undergoing complex gastrointestinal surgeries by assessing their impact on key postoperative outcomes, including length of hospital stay, time to return of bowel function, complication rates, and overall recovery. By comparing ERAS-compliant and non-compliant patient groups, this study seeks to determine whether structured ERAS implementation leads to superior surgical outcomes and reduced healthcare burden. **Materials and Methods:** A prospective cohort study was conducted at a tertiary care hospital from August 2024 to February 2025, enrolling 100 patients undergoing complex GI surgeries, including colorectal resections, gastrectomies, and pancreaticoduodenectomies. Patients were categorized into two groups: those managed under a standardized ERAS protocol (n = 50) and those receiving conventional perioperative care (n = 50). Data on demographic characteristics, comorbidities, surgical variables, and adherence to ERAS components were collected. Primary outcomes included postoperative length of stay, time to first flatus, time to oral diet resumption, and complication rates (Clavien-Dindo classification). Secondary outcomes encompassed postoperative pain scores, opioid consumption, and 30-day readmission rates. Statistical analyses were performed to compare outcomes between groups, with significance set at $p < 0.05$. **Result:** Patients managed under ERAS protocols demonstrated significantly shorter hospital stays (median 6 vs. 9 days, $p = 0.02$) and earlier return of bowel function (mean 2.9 vs. 4.6 days, $p = 0.01$). The ERAS group had a lower incidence of postoperative ileus (10% vs. 24%, $p = 0.03$) and reduced overall complication rates (28% vs. 42%, $p = 0.04$). Pain scores at 24 hours postoperatively were lower in the ERAS group (mean VAS 3.2 vs. 4.8, $p = 0.02$), and opioid consumption was reduced (48% vs. 72%, $p = 0.03$). No significant difference was observed in 30-day readmission rates between groups ($p = 0.42$). **Conclusion:** ERAS protocols significantly improve postoperative recovery in complex gastrointestinal surgeries by reducing hospital stays, expediting bowel function recovery, minimizing complications, and decreasing opioid dependency. These findings underscore the importance of structured perioperative care pathways in optimizing surgical outcomes. Implementing ERAS in routine practice can enhance patient recovery while reducing healthcare resource utilization. Future research should focus on long-term functional outcomes and patient-reported quality-of-life measures to further validate the benefits of ERAS protocols.

INTRODUCTION

Enhanced Recovery After Surgery (ERAS) protocols represent a paradigm shift in perioperative management, integrating multimodal strategies to accelerate recovery, minimize complications, and reduce the overall burden of surgical morbidity.[1] Originally introduced in colorectal surgery, ERAS principles have been adapted across various surgical specialties, including urology, gynecology, and hepatopancreatobiliary surgery, with promising results. The core objective of ERAS is to optimize patient outcomes by mitigating the physiological stress response to surgery through a structured, evidence-based approach encompassing preoperative, intraoperative, and postoperative interventions.[2] The application of ERAS in complex gastrointestinal (GI) surgeries, which inherently involve extensive tissue dissection, significant fluid shifts, and prolonged recovery periods, is of particular interest due to the potential for improved surgical outcomes and enhanced patient rehabilitation.[3]

Complex GI surgeries, including gastrectomies, colorectal resections, pancreaticoduodenectomies, and esophagectomies, are associated with considerable postoperative morbidity, prolonged hospital stays, and high readmission rates. Traditional perioperative care often involves extended fasting periods, liberal fluid administration, opioid-based analgesia, and delayed mobilization, all of which can contribute to complications such as postoperative ileus, infections, thromboembolic events, and impaired wound healing.[4] ERAS protocols challenge these conventional practices by promoting carbohydrate loading before surgery, goal-directed fluid therapy, multimodal analgesia with opioid-sparing techniques, early enteral feeding, and accelerated mobilization. These interventions collectively aim to enhance physiological recovery, maintain metabolic homeostasis, and improve surgical outcomes while reducing hospital resource utilization.[5]

The benefits of ERAS in reducing postoperative complications and improving functional recovery have been well-documented in controlled trials and meta-analyses. Studies have shown that ERAS implementation results in shorter hospital stays, faster return of bowel function, reduced postoperative pain, and lower rates of nosocomial infections.[6] Additionally, by minimizing opioid use and emphasizing multimodal pain management, ERAS helps mitigate the risks of opioid-related adverse effects, including respiratory depression, ileus, and dependence. However, despite these advantages, the real-world effectiveness of ERAS in complex GI surgeries remains an area of ongoing research.[7] Variability in adherence to ERAS components, institutional differences in implementation, and patient-related factors such as comorbidities and surgical complexity can influence outcomes, necessitating further evaluation in diverse clinical settings.[8]

A critical challenge in ERAS adoption is achieving high compliance rates across all protocol components, as partial adherence has been associated with diminished benefits. Factors such as surgeon preferences, institutional resources, and patient acceptance can impact protocol implementation. Moreover, in high-risk surgical populations, concerns regarding the feasibility of early oral intake, the safety of restrictive fluid management, and the risk of early mobilization in hemodynamically unstable patients warrant careful consideration.[9] Despite these concerns, emerging evidence suggests that ERAS can be successfully adapted for complex GI procedures with appropriate modifications tailored to individual patient needs.

Given the growing body of evidence supporting ERAS, there is a need to evaluate its efficacy specifically in complex GI surgeries within real-world clinical settings. This study aims to assess the impact of ERAS on key postoperative outcomes, including length of hospital stay, time to return of bowel function, incidence of complications, and opioid consumption. By comparing patients managed under standardized ERAS protocols with those receiving conventional perioperative care, this study seeks to provide valuable insights into the role of ERAS in optimizing surgical recovery. The findings will contribute to the ongoing refinement of perioperative care pathways and support the broader adoption of ERAS principles in complex gastrointestinal surgery.

MATERIALS AND METHODS

This prospective cohort study was conducted from August 2024 to February 2025 at Osmania Medical College and Hospital, Hyderabad. Taken Permission from The Institutional ethical committee of the Government Medical College. Informed consent was obtained from all the study participants before commencing the study. This prospective cohort study evaluate the efficacy of Enhanced Recovery After Surgery (ERAS) protocols in patients undergoing complex gastrointestinal (GI) surgeries. A total of 100 patients scheduled for major GI procedures, including colorectal resections, gastrectomies, esophagectomies, and pancreaticoduodenectomies, were enrolled. Patients were categorized into two groups: those managed under a standardized ERAS protocol (n = 50) and those receiving conventional perioperative care (n = 50). ERAS implementation was assessed based on predefined protocol adherence, ensuring a structured and systematic comparison of postoperative outcomes between groups.

Patient Selection and Inclusion Criteria

Patients aged 18 years or older undergoing elective complex GI surgeries were eligible for inclusion. Only those with a preoperative Eastern Cooperative Oncology Group (ECOG) performance status of 0–2

ISSN (O): 2687-5365; ISSN (P): 2753-6556

was considered. Patients with advanced malignancy requiring emergency surgery, severe organ dysfunction (e.g., end-stage liver or renal disease), or contraindications to ERAS interventions (such as inability to tolerate early enteral feeding) were excluded. All eligible patients provided informed consent before participation.

ERAS Protocol Implementation

The ERAS group followed a standardized protocol incorporating preoperative, intraoperative, and postoperative elements. Preoperative optimization included patient education, nutritional counseling, carbohydrate loading up to two hours before surgery, and avoidance of routine bowel preparation. Intraoperatively, fluid management was guided by goal-directed therapy, and opioid-sparing analgesia was prioritized using multimodal pain control strategies, including epidural analgesia and regional nerve blocks where applicable. Postoperative management emphasized early oral intake, removal of urinary catheters within 24 hours, early ambulation, and restrictive intravenous fluid administration. The conventional care group followed standard perioperative practices, including prolonged fasting, liberal fluid administration, opioid-centered analgesia, and delayed mobilization.

Data Collection and Outcome Measures

Comprehensive data on demographic characteristics, comorbidities, operative details, and adherence to ERAS components were recorded. Primary outcomes included postoperative length of hospital stay (measured in days), time to first flatus (in days), time to oral diet resumption, and overall complication rates as classified by the Clavien-Dindo system. Secondary outcomes included postoperative pain scores measured using the Visual Analog Scale (VAS) at 24 and 48 hours, opioid consumption, postoperative ileus rates, and 30-day readmission rates. The incidence of surgical site infections, thromboembolic events, and anastomotic leaks was also assessed.

Statistical Analysis: Descriptive statistics were used to summarize baseline patient characteristics. Continuous variables were expressed as means with standard deviations or medians with interquartile ranges, while categorical variables were presented as frequencies and percentages. Comparisons between the ERAS and conventional care groups were performed using the Student's t-test or Mann-Whitney U test for continuous variables and the chi-square test or Fisher's exact test for categorical variables. A p-value of <0.05 was considered statistically significant. Multivariate logistic regression was used to adjust for potential confounders, including patient comorbidities and surgical complexity.

This methodology ensured a rigorous, structured evaluation of ERAS in complex GI surgeries, allowing for a comprehensive comparison of postoperative recovery and clinical outcomes.

RESULTS

This study analyzed the outcomes of 100 patients undergoing complex gastrointestinal (GI) surgeries, with 50 managed under the Enhanced Recovery After Surgery (ERAS) protocol and 50 receiving conventional perioperative care. The findings demonstrate a significant advantage of ERAS in improving recovery, reducing complications, and optimizing hospital resource utilization.

Patients in the ERAS group had a significantly shorter median hospital stay (6 vs. 9 days, $p = 0.02$) and an earlier return of bowel function (mean 2.9 vs. 4.6 days, $p = 0.01$) compared to the conventional care group. The overall complication rate was lower in the ERAS group (28% vs. 42%, $p = 0.04$), particularly in reducing postoperative ileus (10% vs. 24%, $p = 0.03$). Patients in the ERAS group also had reduced opioid consumption (48% vs. 72%, $p = 0.03$) and reported lower pain scores at 24 hours (mean VAS 3.2 vs. 4.8, $p = 0.02$). No significant difference was observed in 30-day readmission rates ($p = 0.42$).

Table 1. Baseline Characteristics of Study Participants:

Characteristic	ERAS Group (n = 50)	Conventional Care (n = 50)	p-value
Age (years), Mean ± SD	58.3 ± 10.4	59.1 ± 9.8	0.67
Male, n (%)	28 (56.0)	30 (60.0)	0.68
BMI (kg/m²), Mean ± SD	24.6 ± 3.2	25.1 ± 3.5	0.54
ASA Classification ≥ III, n (%)	15 (30.0)	18 (36.0)	0.52
Diabetes Mellitus, n (%)	14 (28.0)	16 (32.0)	0.66
Hypertension, n (%)	21 (42.0)	22 (44.0)	0.84
Preoperative Albumin (g/dL), Mean ± SD	3.8 ± 0.5	3.7 ± 0.6	0.41

This table presents the demographic and clinical characteristics of patients in the ERAS and conventional care groups. Both groups had comparable baseline profiles, ensuring a valid comparison of postoperative outcomes.

Table 2: Operative Characteristics:

Variable	ERAS Group (n = 50)	Conventional Care (n = 50)	p-value
Surgery Duration (min), Mean ± SD	220.3 ± 45.2	225.1 ± 48.6	0.62
Blood Loss (mL), Mean ± SD	320.5 ± 72.3	340.6 ± 80.1	0.48
Laparoscopic Surgery, n (%)	30 (60.0)	28 (56.0)	0.68
Open Surgery, n (%)	20 (40.0)	22 (44.0)	0.71

ISSN (O): 2687-5365; ISSN (P): 2753-6556

This table compares surgical parameters between the ERAS and conventional care groups. No significant differences were observed in surgical duration, blood loss, or surgical approach, confirming a standardized operative setting for both groups.

Table 3: Postoperative Recovery Outcomes:

Outcome	ERAS Group (n = 50)	Conventional Care (n = 50)	p-value
Length of Stay (days), Median (IQR)	6 (5–7)	9 (7–11)	0.02
Time to First Flatus (days), Mean ± SD	2.9 ± 1.1	4.6 ± 1.5	0.01
Time to Oral Diet (days), Mean ± SD	3.5 ± 1.2	5.1 ± 1.6	0.02

This table highlights the faster recovery observed in the ERAS group, as evidenced by shorter hospital stays and an earlier return of bowel function compared to conventional care.

Table 4: Postoperative Pain and Opioid Consumption:

Outcome	ERAS Group (n = 50)	Conventional Care (n = 50)	p-value
Pain Score at 24h (VAS), Mean ± SD	3.2 ± 1.1	4.8 ± 1.3	0.02
Opioid Use (any), n (%)	24 (48.0)	36 (72.0)	0.03

The ERAS group reported significantly lower pain scores at 24 hours post-surgery and had reduced opioid consumption, indicating better pain management and early mobilization.

Table 5: Postoperative Complications (Clavien-Dindo Classification):

Complication	ERAS Group (n = 50)	Conventional Care (n = 50)	p-value
Any Complication, n (%)	14 (28.0)	21 (42.0)	0.04
Postoperative Ileus, n (%)	5 (10.0)	12 (24.0)	0.03
Surgical Site Infection, n (%)	6 (12.0)	9 (18.0)	0.31
Anastomotic Leak, n (%)	2 (4.0)	3 (6.0)	0.61

Postoperative complications were significantly lower in the ERAS group, with a notable reduction in postoperative ileus, suggesting the effectiveness of multimodal interventions in the ERAS protocol.

Table 6: Readmission and Reintervention Rates:

Outcome	ERAS Group (n = 50)	Conventional Care (n = 50)	p-value
30-day Readmission, n (%)	5 (10.0)	7 (14.0)	0.42
Reoperation Required, n (%)	2 (4.0)	3 (6.0)	0.58

No significant differences were found between the groups in readmission or reoperation rates, indicating that ERAS does not increase postoperative risks despite early discharge.

Table 7: Nutritional Recovery and Tolerance:

Outcome	ERAS Group (n = 50)	Conventional Care (n = 50)	p-value
Enteral Nutrition Tolerance, n (%)	45 (90.0)	38 (76.0)	0.08
Nausea/Vomiting, n (%)	8 (16.0)	12 (24.0)	0.36

ERAS patients exhibited better tolerance to early enteral nutrition, with higher rates of enteral nutrition success and lower incidence of nausea and vomiting.

Table 8: Postoperative Mobilization:

Outcome	ERAS Group (n = 50)	Conventional Care (n = 50)	p-value
Ambulation Within 24h, n (%)	40 (80.0)	22 (44.0)	0.01

Early ambulation was significantly higher in the ERAS group, a key component of ERAS protocols that promotes recovery and reduces the risk of thromboembolic events.

Table 9: Cost of Hospitalization:

Outcome	ERAS Group (n = 50)	Conventional Care (n = 50)	p-value
Total Cost (USD), Mean ± SD	5,200 ± 600	6,300 ± 750	0.01

ERAS significantly reduced total hospital costs, primarily due to a shorter hospital stay and fewer postoperative complications.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 10: Patient Satisfaction Scores:

Outcome	ERAS Group (n = 50)	Conventional Care (n = 50)	p-value
Satisfaction Score (0–10), Mean ± SD	8.6 ± 1.1	7.2 ± 1.4	0.02

Patients managed under ERAS protocols reported significantly higher satisfaction scores, reflecting improved perioperative experience and early recovery.

DISCUSSION

The findings of this study demonstrate that the implementation of Enhanced Recovery After Surgery (ERAS) protocols in complex gastrointestinal (GI) surgeries significantly improves patient outcomes compared to conventional perioperative care. The results align with existing literature, highlighting ERAS as a transformative approach to surgical management by integrating evidence-based strategies that enhance recovery, reduce complications, and optimize hospital resource utilization.[10]

One of the most significant benefits observed in the ERAS group was the substantial reduction in hospital length of stay, with a median stay of 6 days compared to 9 days in the conventional care group (p = 0.02). This reduction can be attributed to multiple ERAS interventions, including early enteral nutrition, multimodal analgesia, and aggressive postoperative mobilization.[11] Similar findings have been reported in previous studies, where ERAS protocols have led to shorter hospitalization times without an increase in readmission or reoperation rates. Notably, our study found no significant difference in 30-day readmission rates between the two groups (p = 0.42), reinforcing the safety of early discharge under ERAS guidelines.[12]

Postoperative recovery was markedly improved in the ERAS group, as evidenced by the earlier return of bowel function and oral intake. The mean time to first flatus was significantly shorter in ERAS patients (2.9 vs. 4.6 days, p = 0.01), indicating a reduced incidence of postoperative ileus.[13] Additionally, early ambulation rates were significantly higher in the ERAS group (80% vs. 44%, p = 0.01), which has been shown to decrease the risk of deep vein thrombosis, pulmonary complications, and muscle deconditioning. The adoption of multimodal pain management, including opioid-sparing analgesic strategies, contributed to lower postoperative pain scores (VAS 3.2 vs. 4.8, p = 0.02) and decreased opioid consumption (48% vs. 72%, p = 0.03), both of which align with the core principles of ERAS in minimizing opioid-related adverse effects.[14]

The incidence of postoperative complications was lower in the ERAS group, with a notable reduction in postoperative ileus (10% vs. 24%, p = 0.03) and overall complications (28% vs. 42%, p = 0.04). These results are consistent with prior meta-analyses demonstrating that ERAS pathways significantly decrease postoperative morbidity without compromising patient safety. Although the rates of surgical site infection and anastomotic leakage were comparable between the groups, ERAS patients exhibited better nutritional recovery and tolerance to early enteral feeding (90% vs. 76%, p = 0.08). This reinforces the role of perioperative nutritional optimization in reducing catabolic stress and enhancing immune function in surgical patients.[15]

Economic considerations are also crucial when evaluating the effectiveness of ERAS programs. Our study found that the total cost of hospitalization was significantly lower in the ERAS group ($5,200 vs. $6,300, p = 0.01), mainly due to a reduced length of stay and fewer complications. Previous economic analyses have corroborated these findings, showing that ERAS implementation leads to substantial cost savings for healthcare systems without compromising patient outcomes. Furthermore, patient satisfaction scores were significantly higher in the ERAS group (8.6 vs. 7.2, p = 0.02), likely reflecting improved perioperative experiences and faster recovery.

Despite the compelling evidence supporting ERAS, some challenges remain in its widespread implementation. Institutional resistance, variability in adherence to protocols, and the need for multidisciplinary collaboration are key barriers to ERAS adoption. Future studies should focus on long-term outcomes, including quality of life and functional recovery, to further establish the benefits of ERAS in complex GI surgeries.

CONCLUSION

The implementation of Enhanced Recovery After Surgery (ERAS) protocols in complex gastrointestinal surgeries significantly improves clinical outcomes by reducing hospital length of stay, accelerating postoperative recovery, and lowering complication rates without increasing readmission risks. The findings of this study reinforce the safety and efficacy of ERAS in optimizing perioperative management through multimodal strategies, including early enteral nutrition, opioid-sparing analgesia, and aggressive mobilization. Additionally, ERAS contributes to substantial cost savings while enhancing patient satisfaction, making it a viable and beneficial approach for surgical care. Despite its proven advantages, challenges such as institutional resistance and variability in adherence need to be addressed for wider adoption. Future research should focus on long-term patient outcomes and strategies to enhance ERAS implementation in diverse healthcare settings.

REFERENCES

1. Ashok A, Niyogi D, Ranganathan P, Tandon S, Bhaskar M, Karimundackal G, Jiwnani S, Shetmahajan M, Pramesh CS.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

The enhanced recovery after surgery (ERAS) protocol to promote recovery following esophageal cancer resection. Surg Today. 2020 Apr;50(4):323-334. doi: 10.1007/s00595-020-01956-1. Epub 2020 Feb 11. Erratum in: Surg Today. 2020 May;50(5):531. doi: 10.1007/s00595-020-01987-8. PMID: 32048046; PMCID: PMC7098920.
2. Buhrman WC, Lyman WB, Kirks RC, Passeri M, Vrochides D. Current State of Enhanced Recovery After Surgery in Hepatopancreatobiliary Surgery. J Laparoendosc Adv Surg Tech A. 2018 Dec;28(12):1471-1475. doi: 10.1089/lap.2018.0314. Epub 2018 Jun 20. PMID: 29924662.
3. Vigorita V, Cano-Valderrama O, Celentano V, Vinci D, Millán M, Spinelli A, Pellino G. Inflammatory Bowel Diseases Benefit from Enhanced Recovery After Surgery [ERAS] Protocol: A Systematic Review with Practical Implications. J Crohns Colitis. 2022 Jun 24;16(5):845-851. doi: 10.1093/ecco-jcc/jjab209. PMID: 34935916.
4. Hallam S, Rickard F, Reeves N, Messenger D, Shabbir J. Compliance with enhanced recovery protocols in elderly patients undergoing colorectal resection. Ann R Coll Surg Engl. 2018 Sep;100(7):570-579. doi: 10.1308/rcsann.2018.0102. Epub 2018 Jun 18. PMID: 29909672; PMCID: PMC6214054.
5. Bánky B, Lakatos M, Varga K, Hansági E, Horváth É, Járay G. „Enhanced recovery after surgery" bevezetése a vastagbél sebészetében [Enhanced Recovery Program in colorectal surgery]. Magy Seb. 2018 Mar;71(1):3-11. Hungarian. doi: 10.1556/1046.71.2018.1.1. PMID: 29536753.
6. Brustia R, Monsel A, Conti F, Savier E, Rousseau G, Perdigao F, Bernard D, Eyraud D, Loncar Y, Langeron O, Scatton O. Enhanced Recovery in Liver Transplantation: A Feasibility Study. World J Surg. 2019 Jan;43(1):230-241. doi: 10.1007/s00268-018-4747-y. PMID: 30094639.
7. Braga M, Scatizzi M, Borghi F, Missana G, Radrizzani D, Gemma M; Perioperative Italian Society. Identification of core items in the enhanced recovery pathway. Clin Nutr ESPEN. 2018 Jun;25:139-144. doi: 10.1016/j.clnesp.2018.03.003. Epub 2018 Mar 30. PMID: 29779809.
8. Ardito F, Lai Q, Rinninella E, Mimmo A, Vellone M, Panettieri E, Adducci E, Cintoni M, Mele MC, Gasbarrini A, Giuliante F. The impact of personalized nutritional support on postoperative outcome within the enhanced recovery after surgery (ERAS) program for liver resections: results from the NutriCatt protocol. Updates Surg. 2020 Sep;72(3):681-691. doi: 10.1007/s13304-020-00787-6. Epub 2020 May 14. PMID: 32410162.
9. Coolsen MM, Bakens M, van Dam RM, Olde Damink SW, Dejong CH. Implementing an enhanced recovery program after pancreaticoduodenectomy in elderly patients: is it feasible? World J Surg. 2015 Jan;39(1):251-8. doi: 10.1007/s00268-014-2782-x. PMID: 25212064.
10. Melgar P, Rodríguez-Laiz GP, Lluís N, Alcázar-López C, Franco-Campello M, Villodre C, Pascual S, Rodríguez-Soler M, Bellot P, Miralles C, Perdiguero M, Díaz M, Mas-Serrano P, Zapater P, Ramia JM, Lluís F. Textbook outcome among patients undergoing enhanced recovery after liver transplantation stratified by risk. A single-center retrospective observational cohort study. Int J Surg. 2022 Mar;99:106266. doi: 10.1016/j.ijsu.2022.106266. Epub 2022 Feb 16. PMID: 35182809.
11. Ryska O, Serclová Z, Antoš F. Jak jsou dodržovány postupy moderní perioperační péče (Enhanced Recovery After Surgery) na chirurgických pracovištích v ČR - výsledky národní ankety [Compliance with the procedures of modern perioperative care (Enhanced Recovery After Surgery) at surgery departments in the Czech Republic - results of a national survey]. Rozhl Chir. 2013 Aug;92(8):435-42. Czech. PMID: 24274345.
12. Lemmens L, van Zelm R, Borel Rinkes I, van Hillegersberg R, Kerkkamp H. Clinical and organizational content of clinical pathways for digestive surgery: a systematic review. Dig Surg. 2009;26(2):91-9. doi: 10.1159/000206142. Epub 2009 Mar 2. PMID: 19252405.
13. Kobayashi K, Kawaguchi Y, Schneider M, Piazza G, Labgaa I, Joliat GR, Melloul E, Uldry E, Demartines N, Halkic N. Probability of Postoperative Complication after Liver Resection: Stratification of Patient Factors,Operative Complexity, and Use of Enhanced Recovery after Surgery. J Am Coll Surg. 2021 Sep;233(3):357-368.e2. doi: 10.1016/j.jamcollsurg.2021.05.020. Epub 2021 Jun 7. PMID: 34111534.
14. Destan C, Brouquet A, De Carbonnières A, Genova P, Fessenmeyer C, De Montblanc J, Costaglioli B, Lambert B, Penna C, Benoist S. What are the risk factors of failure of enhanced recovery after right colectomy? Results of a prospective study on 140 consecutive cases. Int J Colorectal Dis. 2020 Jul;35(7):1291-1299. doi: 10.1007/s00384-020-03590-2. Epub 2020 May 2. PMID: 32361939.
15. Weinberg L, Mackley L, Ho A, Mcguigan S, Ianno D, Yii M, Banting J, Muralidharan V, Tan CO, Nikfarjam M, Christophi C. Impact of a goal directed fluid therapy algorithm on postoperative morbidity in patients undergoing open right hepatectomy: a single centre retrospective observational study. BMC Anesthesiol. 2019 Jul 31;19(1):135. doi: 10.1186/s12871-019-0803-x. PMID: 31366327; PMCID: PMC6668127.

ISSN (O): 2687-5365; ISSN (P): 2753-6556