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IMPACT OF ENHANCED RECOVERY AFTER SURGERY (ERAS) PROTOCOL IMPLEMENTATION ON LENGTH OF HOSPITAL STAY AND POSTOPERATIVE OUTCOMES IN GENERAL SURGERY: A RETROSPECTIVE COHORT STUDY

IMPACTO DA IMPLEMENTAÇÃO DO PROTOCOLO DE RECUPERAÇÃO APRIMORADA APÓS CIRURGIA (ERAS) NA DURAÇÃO DA INTERNAÇÃO HOSPITALAR E NOS RESULTADOS PÓS-OPERATÓRIOS EM CIRURGIA GERAL: UM ESTUDO DE COORTE RETROSPECTIVO

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Abstract
Background: Enhanced Recovery After Surgery (ERAS) protocols are multidisciplinary, evidence-based perioperative pathways designed to reduce surgical stress, enhance functional recovery, and improve postoperative outcomes. While ERAS implementation has frequently been associated with reduced length of hospital stay (LOS), its effect may vary across healthcare settings with already optimized perioperative and discharge practices. Objective: To evaluate the association between ERAS protocol implementation and length of hospital stay among general surgery patients, and to assess its impact on postoperative complications and early recovery indicators. Methods: A retrospective cohort study was conducted at King Faisal Hospital, Makkah, Saudi Arabia, using electronic medical records from January 2022 to December

Resumo
Contexto: Os protocolos de Recuperação Aprimorada após Cirurgia (ERAS) são caminhos perioperatórios multidisciplinares e baseados em evidências, projetados para reduzir o estresse cirúrgico, aprimorar a recuperação funcional e melhorar os resultados pós-operatórios. Embora a implementação do ERAS tenha sido frequentemente associada à redução do tempo de internação hospitalar (LOS), seu efeito pode variar entre os ambientes de saúde com práticas perioperatórias e de alta já otimizadas. Objetivo: Avaliar a associação entre a implementação do protocolo ERAS e o tempo de internação hospitalar entre pacientes de cirurgia geral e avaliar seu impacto nas complicações pós-operatórias e nos indicadores de recuperação precoce.

2023. A total of 938 patients who underwent general surgery procedures were included and categorized into ERAS and non-ERAS groups. Demographic characteristics, surgical and anesthetic factors, postoperative recovery indicators, and clinical outcomes were analyzed. Length of hospital stay was assessed using predefined duration categories. Comparative analyses were performed using chi-square tests and either t-tests or Mann–Whitney U tests, as appropriate. Statistical significance was set at $p < .05$. Results: ERAS protocols were implemented in 91.3% of patients. No statistically significant difference in length of hospital stay was observed between ERAS and non-ERAS groups (89.6% vs. 90.2% with LOS < 1 week, $p = .674$). In contrast, ERAS implementation was associated with a significantly lower overall rate of postoperative complications (4.8% vs. 20.7%, $p < .001$), particularly gastrointestinal (1.5% vs. 12.2%, $p < .001$) and respiratory complications (0.5% vs. 3.7%, $p < .001$). Patients managed with ERAS protocols demonstrated improved early recovery indicators, including earlier tolerance of oral intake and reduced postoperative nausea. ICU admission rates were low in both groups, and hospital readmission rates showed a statistically significant but clinically small absolute difference. Conclusion: ERAS protocol implementation in general surgery is associated with substantial reductions in postoperative complications and improvements in early recovery outcomes. Although no reduction in length of hospital stay was observed—likely reflecting already optimized institutional discharge pathways—these findings support the continued integration of ERAS principles to enhance perioperative care quality.

Keywords: Enhanced Recovery After Surgery, ERAS, General Surgery, Length of Hospital Stay, Postoperative Complications, Perioperative Care, Saudi Arabia.

Métodos: Um estudo de coorte retrospectivo foi realizado no King Faisal Hospital, em Meca, Arábia Saudita, usando registros médicos eletrônicos de janeiro de 2022 a dezembro de 2023. Um total de 938 pacientes submetidos a procedimentos de cirurgia geral foram incluídos e categorizados em grupos ERAS e não ERAS. Foram analisadas características demográficas, fatores cirúrgicos e anestésicos, indicadores de recuperação pós-operatória e resultados clínicos. A duração da internação hospitalar foi avaliada usando categorias de duração predefinidas. Análises comparativas foram realizadas usando testes qui-quadrado e testes t ou Mann-Whitney U, conforme apropriado. A significância estatística foi definida como $p < 0,05$. Resultados: Os protocolos ERAS foram implementados em 91,3% dos pacientes. Não foi observada diferença estatisticamente significativa na duração da internação hospitalar entre os grupos ERAS e não ERAS (89,6% vs. 90,2% com LOS < 1 semana, $p = 0,674$). Em contrapartida, a implementação do ERAS foi associada a uma taxa global significativamente menor de complicações pós-operatórias (4,8% vs. 20,7%, $p < 0,001$), particularmente complicações gastrointestinais (1,5% vs. 12,2%, $p < 0,001$) e respiratórias (0,5% vs. 3,7%, $p < 0,001$). Os pacientes tratados com protocolos ERAS demonstraram melhores indicadores de recuperação precoce, incluindo tolerância mais rápida à ingestão oral e redução da náusea pós-operatória. As taxas de admissão na UTI foram baixas em ambos os grupos, e as taxas de readmissão hospitalar mostraram uma diferença absoluta estatisticamente significativa, mas clinicamente pequena. Conclusão: A implementação do protocolo ERAS na cirurgia geral está associada a reduções substanciais nas complicações pós-operatórias e melhorias nos resultados de recuperação precoce. Embora não tenha sido observada redução no tempo de internação hospitalar — provavelmente refletindo os fluxos de alta institucional já otimizados —, esses achados apoiam a integração contínua dos princípios ERAS para melhorar a qualidade do atendimento perioperatório.

Palavras-chave: *Recuperação Aprimorada Após Cirurgia. ERAS. Cirurgia Geral. Tempo de Internação Hospitalar. Complicações Pós-operatórias. Cuidados Perioperatórios. Arábia Saudita.*

1 INTRODUCTION

Enhanced Recovery After Surgery (ERAS) protocols represent a paradigm shift in perioperative care by integrating evidence-based interventions across the preoperative, intraoperative, and postoperative continuum. Since their introduction in the late 1990s, ERAS programs have aimed to mitigate the physiological stress response to surgery, preserve organ function, and accelerate recovery through a structured multidisciplinary approach (Kehlet & Wilmore, 2002).

Traditional perioperative pathways were often characterized by prolonged fasting, delayed mobilization, liberal opioid use, and inconsistent postoperative nutrition practices, which may contribute to increased morbidity and prolonged hospitalization. In contrast, ERAS pathways emphasize standardized care focused on patient-centered recovery and early functional restoration (Fearon *et al*., 2005).

Core ERAS components include preoperative patient education, reduced fasting with carbohydrate loading, opioid-sparing multimodal analgesia, goal-directed fluid therapy, early mobilization, and early postoperative oral nutrition (Gustafsson *et al*., 2012). When implemented collectively, these interventions act synergistically to reduce insulin resistance, attenuate inflammatory responses, and improve patient experience (Melnyk *et al*., 2011).

Evidence from randomized trials and observational studies suggests that ERAS implementation is associated with improved postoperative outcomes across multiple specialties, including shorter LOS, lower complication rates, reduced opioid consumption, and improved patient satisfaction without increasing readmission or mortality (Ljungqvist *et al*., 2017; Ripollés-Melchor *et al*., 2019). Meta-analyses in gastrointestinal and general surgery populations have also reported reductions in postoperative complications and faster functional recovery among patients managed within ERAS pathways (Li *et al*., 2017).

However, the effect of ERAS on LOS may not be uniform across healthcare settings. In institutions with already optimized perioperative workflows and discharge planning, further reductions in LOS may be limited by a ceiling effect (Qin *et al*., 2024). In such contexts, ERAS impact may be better reflected in clinical quality indicators—such as complications, return of gastrointestinal function, and early recovery measures—rather than LOS alone (Weets *et al*., 2024; Wang *et al*., 2024).

Successful ERAS implementation is a systems-level change that depends on multidisciplinary coordination and protocol adherence. Variability in adoption, documentation, and compliance may influence observed outcomes and complicate comparisons across studies; therefore, local evaluation remains essential to understand real-world effectiveness.

Although ERAS has been widely adopted in Europe and North America, evidence from Middle Eastern healthcare systems remains limited. Differences in case mix, institutional resources, and baseline perioperative practices underscore the need for context-specific evaluation (Aleid *et al*., 2023).

Accordingly, this study evaluates the association between ERAS protocol implementation and LOS among general surgery patients at a tertiary care hospital in Saudi Arabia, and examines its impact on postoperative complications and early recovery outcomes using a retrospective cohort design.

1.1 Study design and setting

This retrospective cohort study was conducted at King Faisal Hospital, Makkah, Saudi Arabia, using electronic medical records from January 2022 to December 2023.

1.2 Ethical Approval

Ethical approval was obtained from the Research Ethics Committee of King Faisal Hospital, Makkah, Saudi Arabia (Approval No. H-02-K-076-0924-1174).

1.3 Study population

Patients of all ages and both sexes who underwent general surgery procedures during the study period were eligible. Exclusion criteria included incomplete or missing medical records, immunodeficiency disorders, pregnancy, and procedures performed outside the General Surgery Department.

1.4 Data collection

Data were extracted using a secured electronic tool and included demographic characteristics, urgency and type of surgery, anesthesia and analgesia details, antibiotic prophylaxis, ERAS implementation and timing, postoperative recovery indicators (pain, oral intake, mobilization, voiding, nausea, and vomiting), postoperative complications, ICU admission, readmission, and length of hospital stay (LOS).

1.5 Statistical analysis

Analyses were performed using SPSS version 26. Categorical variables are presented as frequencies and percentages, while continuous variables are presented as means ± standard deviations or medians (ranges), as appropriate. Group comparisons were conducted using chi-square tests and t-tests or Mann–Whitney U tests. Length of hospital stay (LOS) was analyzed as a categorical variable and classified into predefined duration categories (<1 week, 1–2 weeks, 2–3 weeks, and >3 weeks). Missing data were excluded from specific analyses. Given the exploratory nature of secondary outcomes, no adjustment for multiple comparisons was applied. Statistical significance was set at $p < .05$.

2 RESULTS

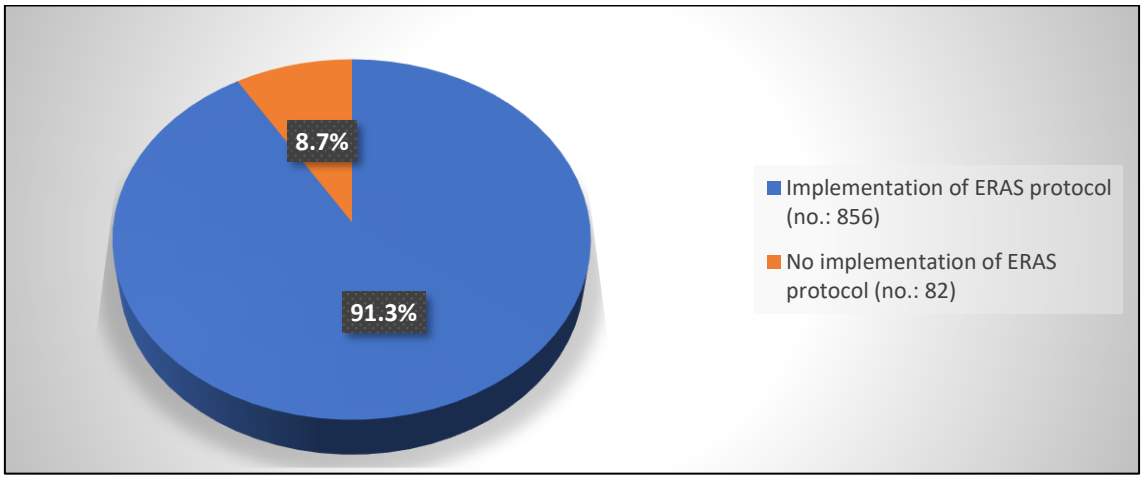
2.1 RAS implementation

A total of 938 patients who underwent general surgery procedures during the study period were included in the analysis. ERAS protocols were implemented in 856 patients (91.3%), while 82 patients (8.7%) received standard perioperative care without ERAS implementation.

The high rate of ERAS adoption reflects institutional integration of ERAS principles across routine perioperative workflows.

Figure 1

Overall, ERAS implementation rate among the study population (n = 938).

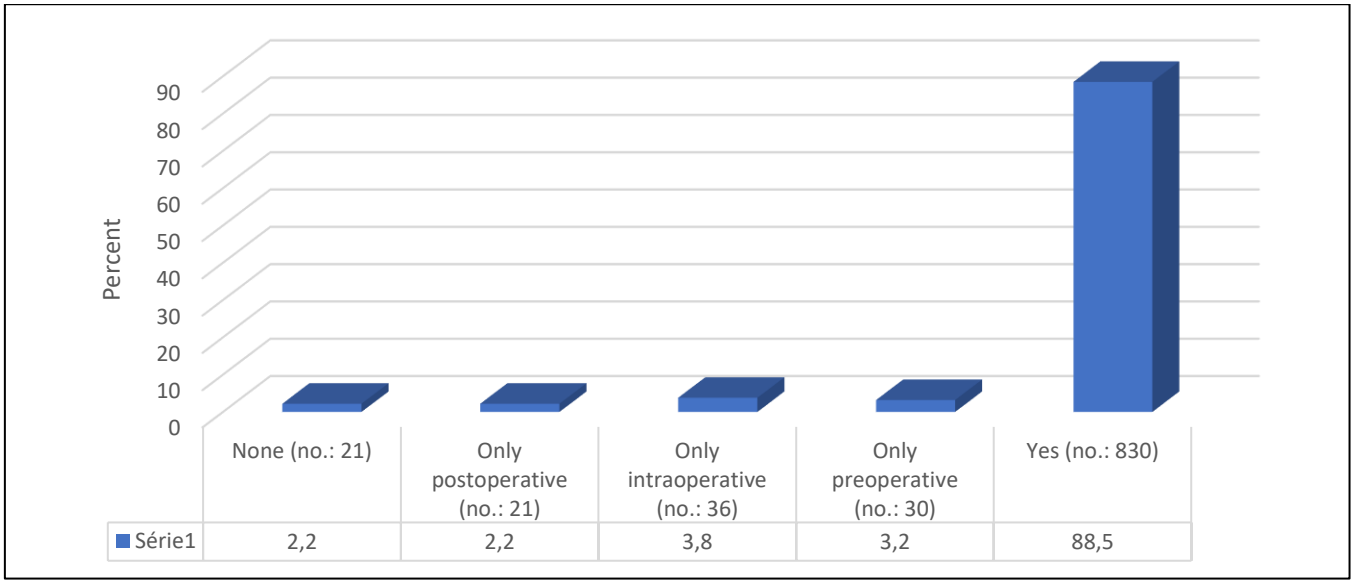


This figure illustrates the proportion of patients managed with ERAS protocols compared with those receiving standard perioperative care.

In addition to overall ERAS adoption, the timing of ERAS protocol implementation across different perioperative phases was evaluated. ERAS components were applied variably during the preoperative, intraoperative, and postoperative periods, reflecting multidisciplinary involvement throughout the surgical pathway.

Figure 2

Timing of ERAS protocol implementation across perioperative phases.



2.2 Baseline characteristics

Baseline demographic and clinical characteristics of the study population are summarized according to ERAS implementation status (Table 1). The majority of patients were aged between 18 and 45 years (72.5%), and males comprised 61.9% of the cohort.

ERAS protocol implementation was significantly associated with surgical urgency, with higher implementation observed among emergency procedures ($p < .001$), and with type of analgesia ($p = .037$). No statistically significant associations were observed between ERAS implementation and patient age, sex, antibiotic prophylaxis use, oral intake status, or duration of analgesia.

These findings indicate that ERAS adoption was more common in acute surgical settings, while remaining broadly applicable across different demographic groups.

Table 1

Baseline demographic and clinical characteristics by ERAS implementation status.

Variable	**Total**	**No implementation of ERAS protocol (No.: %)**	**Implementation of ERAS protocol (No.: %)**	**χ2**	**p-value**
	No. (%)	No. (%)	No. (%)		
Age (years)					
<18	38 (4.1)	0 (0.0)	38 (4.4)	3.87	0.144
18 - 45	680 (72.5)	63 (76.8)	617 (72.7)		
>45	220 (23.5)	19 (23.2)	201 (23.5)		
Gender					
Female	357 (38.1)	25 (30.5)	332 (38.8)	2.18	0.139
Male	581 (61.9)	57 (69.5)	524 (61.2)		
Clinical criteria for surgery					
Elective	546 (58.2)	28 (34.1)	518 (60.5)	21.38	**<0.001**
Emergency	392 (41.8)	54 (65.9)	338 (69.5)		
Use of antibiotics prophylaxis					
No	40 (4.3)	6 (7.3)	34 (4)	5.04	0.08
Unknown	14 (1.5)	3 (3.7)	11 (1.3)		
Yes	884 (94.2)	73 (89)	811 (94.7)		
Oral intake					
NPO	907 (96.7)	77 (93.9)	830 (97)	2.19	0.139
Unknown	31 (3.3)	5 (6.1)	26 (3)		
Type of analgesia					
Epidural	44 (4.7)	7 (8.5)	37 (4.3)	10.18	**0.037**
General	685 (73)	65 (79.3)	620 (72.4)		
Local	143 (15.2)	10 (12.2)	133 (15.5)		
Sedation	6 (0.6)	0 (0.0)	6 (0.7)		
Spinal	60 (6.4)	0 (0.0)	60 (7)		
Analgesia duration					
<30 min	189 (20.1)	20 (24.4)	169 (19.7)	3.64	0.303
30 min - <60 min	262 (27.9)	16 (19.5)	246 (28.7)		
60 min – 120 min	323 (34.4)	32 (39)	291 (34)		

>120min	164 (17.5)	14 (17.1)	150 (17.5)		

Note. Values are presented as number (%). Group comparisons were performed using the chi-square (χ^2) test. Statistical significance was set at $p < .05$. ERAS = Enhanced Recovery After Surgery

2.2.1 Postoperative Recovery Indicators.

Postoperative recovery indicators were compared between ERAS and non-ERAS groups **(Table 2).** ERAS implementation was significantly associated with earlier tolerance of oral intake, lower rates of postoperative nausea, and earlier postoperative voiding ($p < .05$).

No statistically significant differences were observed between groups regarding postoperative vomiting, mobilization timing, or use of postoperative nausea and vomiting prophylaxis.

Assessment of postoperative pain scores was limited by inconsistent documentation across medical records, which restricted comprehensive comparative analysis of pain-related outcomes between groups.

Table 2

Postoperative recovery indicators by ERAS implementation status.

Variable	Total	No implementation of ERAS protocol (No.: %)	Implementation of ERAS protocol (No.: %)	$\chi 2$	p-value
	No. (%)	No. (%)	No. (%)		
Post operative pain score					
NA	690 (73.6)	81 (98.8)	609 (71.1)	19.39	**<0.001**
Mild	221 (23.6)	1 (1.2)	220 (25.7)		
Moderate	25 (2.7)	0 (0.0)	25 (2.9)		
Severe	2 (0.2)	0 (0.0)	2 (0.2)		
Diet type post OP					
IVF	2 (0.2)	0 (0.0)	2 (0.2)	18.01	**0.006**
Liquid	453 (48.3)	57 (69.5)	396 (46.3)		
NGT	26 (2.8)	1 (1.2)	25 (2.9)		
NPO	4 (0.4)	0 (0.0)	4 (0.5)		
Solid	404 (43.1)	20 (24.4)	384 (44.9)		
TBN	5 (0.5)	1 (1.2)	4 (0.5)		
Unknown	44 (4.7)	3 (3.7)	41 (4.8)		
Post operative nausea					
No	821 (87.5)	56 (68.3)	765 (89.4)	19.15	**<0.001**
Unknown	65 (6.9)	5 (6.1)	60 (7)		
Yes	52 (5.5)	21 (25.6)	31 (3.6)		
Post operative vomiting					
No	857 (91.4)	76 (92.7)	781 (91.2)	0.2	0.905
Unknown	68 (7.2)	5 (6.1)	63 (7.4)		

Yes	13 (1.4)	1 (1.2)	12 (1.4)		
Use of post operative nausea and vomiting prophylaxis					
No	622 (66.3)	60 (73.2)	562 (65.7)	2.05	0.357
Unknown	47 (5)	4 (4.9)	43 (5)		
Yes	269 (28.7)	18 (22)	251 (29.3)		
First day of tolerating orally					
Day 0	11 (1.2)	0 (0.0)	11 (1.3)	12.8	**0.012**
Day 1 post OP	708 (75.5)	62 (75.6)	646 (75.5)		
Day 2-3 post OP	98 (10.4)	16 (19.5)	82 (9.6)		
Day 4-5 post OP	16 (1.7)	1 (1.2)	15 (1.8)		
Unknown	105 (11.2)	3 (3.7)	102 (11.9)		
Mobilization					
Day 0	11 (1.2)	0 (0.0)	11 (1.3)	5.8	0.215
Day 1 post OP	710 (75.7)	70 (85.4)	640 (74.8)		
Day 2-3 post OP	96 (10.2)	7 (8.5)	89 (10.4)		
Day 4-5 post OP	7 (0.7)	0 (0.0)	7 (0.8)		
Unknown	114 (12.2)	5 (6.1)	109 (12.7)		
Voiding					
Day 0	11 (1.2)	0 (0.0)	11 (1.3)	10.34	**<0.001**
Day 1 post OP	598 (63.8)	75 (91.5)	523 (61.1)		
Day 2-3 post OP	43 (4.6)	2 (2.4)	41 (4.8)		
Day 4-5 post OP	6 (0.6)	0 (0.0)	6 (0.7)		
Day 6	1 (0.1)	0 (0.0)	1 (0.1)		
Unknown	279 (29.7)	5 (6.1)	274 (32)		

Note. Values are presented as number (%). Group comparisons were performed using the chi-square (χ^2) test. $p < .05$ was considered statistically significant. ERAS = Enhanced Recovery After Surgery. "Unknown" indicates missing or undocumented data.

2.3 Postoperative outcomes and complications

Postoperative clinical outcomes were compared between ERAS and non-ERAS groups (Table 3). Overall, postoperative complications occurred in 6.2% of the total study population.

The rate of overall postoperative complications was significantly lower among patients managed with ERAS protocols compared with those who did not receive ERAS care (4.8% vs. 20.7%, $p < .001$). Significant differences were observed in gastrointestinal complications (1.5% vs. 12.2%, $p < .001$) and respiratory complications (0.5% vs. 3.7%, $p < .001$).

A statistically significant difference in hospital readmission rates was observed between groups; however, the absolute difference was small.

Table 3

Postoperative outcomes and complications by ERAS implementation status.

Variable	Total	No implementation of ERAS protocol (No.: %)	Implementation of ERAS protocol (No.: %)	χ2	p-value
	No. (%)	No. (%)	No. (%)		
Post operative complications					
No	880 (93.8)	65 (79.3)	815 (95.2)	12.78	**<0.001**
Yes	58 (6.2)	17 (20.7)	41 (4.8)		
Type of post operative complications: (no.: 58)					
Infection	21 (36.2)	4 (4.9)	17 (2)	2.86	0.091
Hematology	7 (12)	2 (2.4)	5 (0.6)	3.47	0.062
Gastrointestinal	23 (39.6)	10 (12.2)	13 (1.5)	15.66	**<0.001**
Respiratory	7 (12)	3 (3.7)	4 (0.5)	10.28	**<0.001**
Cardiovascular	3 (5.1)	0 (0.0)	3 (0.4)	0.38	0.591
Renal	2 (3.4)	1 (1.2)	1 (0.1)	4.27	**0.039**
Neurological	1 (1.7)	0 (0.0)	1 (0.1)	0.09	0.757
Death	1 (1.7)	0 (0.0)	1 (0.1)	0.09	0.757
Re-admission					
No	903 (96.3)	77 (93.9)	826 (96.5)	10.88	**0.004**
Unknown	1 (0.1)	1 (1.2)	0 (0.0)		
Yes	34 (3.6)	4 (4.9)	30 (3.5)		
ICU admission					
No	911 (97.1)	81 (98.8)	830 (97)	0.88	0.347
Yes	27 (2.9)	1 (1.2)	26 (3)		
Length of hospital stay (LHS)					
Less than 1 week	841 (89.7)	74 (90.2)	767 (89.6)	1.53	0.674
1-2 weeks	27 (2.9)	2 (2.4)	25 (2.9)		
2-3 weeks	13 (1.4)	0 (0.0)	13 (1.5)		
More than 3 weeks	57 (6.1)	6 (7.3)	51 (6)		

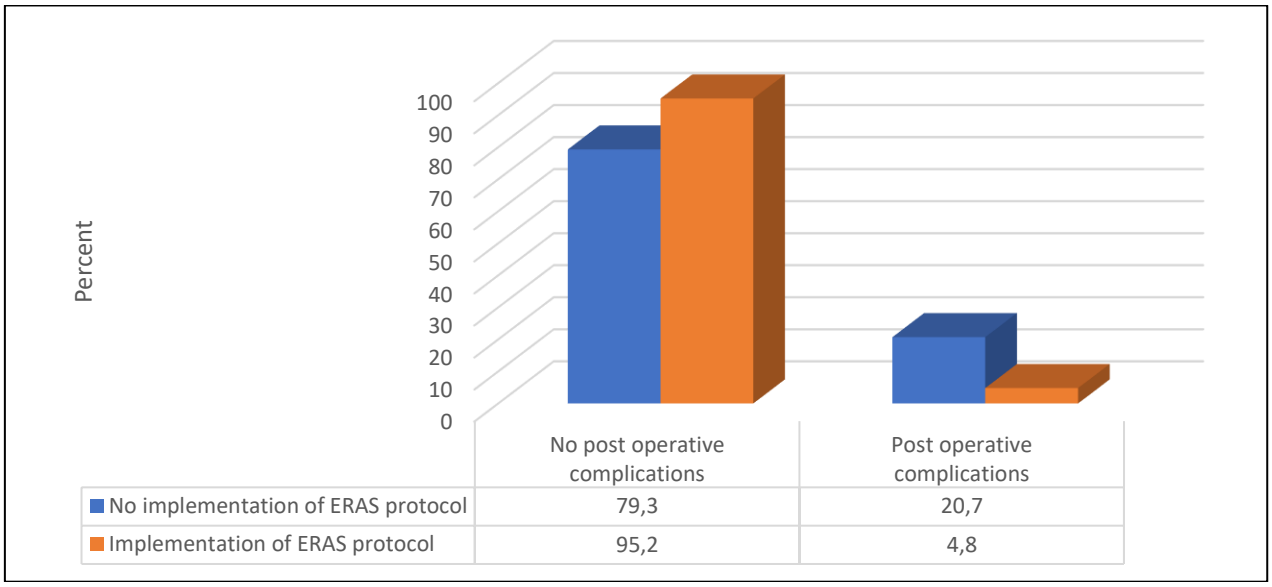
Note. Values are presented as number (%). Group comparisons were performed using the chi-square (χ^2) test. Length of hospital stay (LOS) was analyzed as a categorical variable (<1 week, 1–2 weeks, 2–3 weeks, and >3 weeks). Statistical significance was defined as $p < .05$. ERAS = Enhanced Recovery After Surgery; ICU = intensive care unit.

2.3.1 Postoperative Complication Rates

A comparison of postoperative complication rates between ERAS and non-ERAS groups showed a lower overall incidence of complications among patients managed with ERAS protocols (4.8% vs. 20.7%, p < .001) (Table 3, Figure 3).

Figure 3

Comparison of postoperative complication rates between ERAS and non-ERAS groups.



Note. Comparison based on the chi-square (χ^2) test ($\chi^2 = 12.78$, $p < .001$).

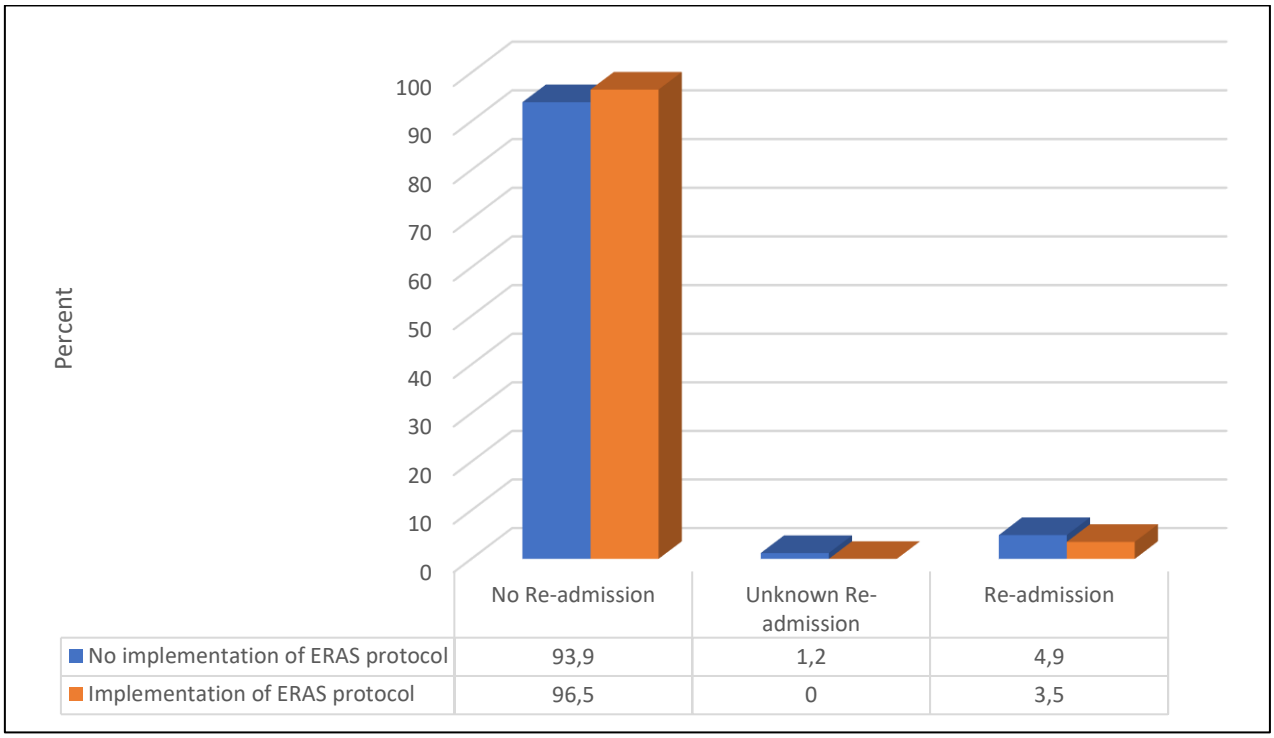
2.4 ICU Admission and readmission outcomes

ICU admission and hospital readmission rates were evaluated (Table 3, Figure 4). ICU admission rates were low and did not differ significantly between ERAS and non-ERAS groups ($p = .347$).

Hospital readmission rates were also low in both groups; a statistically significant difference was observed between ERAS and non-ERAS groups ($p = .004$), with a small absolute difference in proportions.

Figure 4

ICU admission and hospital readmission rates by ERAS implementation status.



Note. Chi-square test for hospital readmission ($\chi^2 = 10.88$, $p = .004$).

3 DISCUSSION

This retrospective cohort study shows that ERAS protocol implementation in general surgery is associated with lower rates of postoperative complications and improved early recovery indicators. These findings are consistent with previous studies reporting beneficial effects of ERAS pathways on perioperative outcomes and postoperative morbidity.

The absence of a statistically significant reduction in length of hospital stay (LOS) in the present study may reflect a ceiling effect related to already optimized perioperative workflows and discharge practices at the study institution. In healthcare settings where LOS is relatively short and discharge criteria are well standardized, additional reductions in LOS may be limited. In such contexts, the impact of ERAS protocols may be better captured by improvements in clinical quality indicators, including postoperative complication rates, gastrointestinal recovery, and early functional outcomes, rather than LOS alone.

The observed reduction in gastrointestinal and respiratory complications among patients managed with ERAS protocols is consistent with the intended effects of key ERAS components, including early mobilization, opioid-sparing multimodal analgesia, and early postoperative nutrition. These elements are designed to support physiological recovery and have been associated with lower postoperative morbidity in previous studies. In the present study, ERAS implementation was not accompanied by higher ICU admission or readmission rates.

Variability in reported ERAS outcomes across studies may be attributed to differences in baseline perioperative practices, institutional resources, patient populations, and levels of protocol adherence. The findings of this study emphasize the value of evaluating ERAS performance within specific healthcare environments to better understand its real-world impact and contextual applicability.

Although ERAS programs have been widely adopted in Europe and North America, evidence from Middle Eastern healthcare systems remains relatively limited. Differences in patient demographics, surgical case-mix, institutional resources, and baseline perioperative practices underscore the need for local evaluation to assess feasibility, effectiveness, and contextual applicability.

Overall, the results of the present study are consistent with the continued integration of ERAS principles within general surgery practice, particularly in healthcare settings where the primary goal is to improve postoperative outcomes and quality of care rather than to achieve further reductions in length of hospital stay.

3.1 Limitations

This study has several limitations. The high rate of ERAS implementation resulted in a relatively small non-ERAS comparison group, which may have limited subgroup analyses and introduced potential selection bias. In addition, the degree of adherence to ERAS protocols and compliance with individual protocol components could not be quantified due to the retrospective study design. Postoperative pain scores were inconsistently documented across medical records, limiting detailed comparative assessment of pain-related recovery outcomes. Furthermore, the single-center design may restrict generalizability, and long-term postoperative outcomes were not evaluated.

4 CONCLUSION

In this retrospective cohort study, implementation of Enhanced Recovery After Surgery (ERAS) protocols in general surgery was associated with lower postoperative complication rates and improvements in selected early recovery indicators. No significant difference in length of hospital stay was observed between ERAS and non-ERAS groups. These findings suggest that, in settings with established perioperative and discharge practices, ERAS implementation may primarily be reflected in postoperative morbidity and recovery-related outcomes rather than hospitalization duration. Further multicenter studies are warranted to evaluate the impact of ERAS across diverse healthcare contexts.

REFERENCES

Aleid, A., Alyaseen, E. M., Alfurayji, R. S., Alanazi, B. S., Alquraish, F. A., Al Mutair, A., Alessa, M., & Albinsaad, L. (2023). Enhanced recovery after surgery (ERAS) in Saudi Arabian surgical practice: A comprehensive analysis of surgical outcomes, patient satisfaction, and cost-effectiveness. Cureus, 15(11), e49448. https://doi.org/10.7759/cureus.49448

Batchelor, T. J. P., Rasburn, N. J., Abdelnour-Berchtold, E., Brunelli, A., Cerfolio, R. J., Gonzalez, M., Ljungqvist, O., Petersen, R. H., Popescu, W. M., Slinger, P. D., Naidu, B., & ERAS Society and European Society of Thoracic Surgeons. (2019). Guidelines for enhanced recovery after lung surgery: Recommendations of the Enhanced Recovery After Surgery Society and the European Society of Thoracic Surgeons. European Journal of Cardio-Thoracic Surgery, 55(1), 91–115. https://doi.org/10.1093/ejcts/ezy301

Fearon, K. C. H., Ljungqvist, O., Von Meyenfeldt, M., Revhaug, A., Dejong, C. H. C., Lassen, K., Nygren, J., Hausel, J., Soop, M., Andersen, J., & Kehlet, H. (2005). Enhanced recovery after surgery: A consensus review of clinical care for patients undergoing colonic resection. Clinical Nutrition, 24(3), 466–477. https://doi.org/10.1016/j.clnu.2005.02.002

Gustafsson, U. O., Scott, M. J., Schwenk, W., Demartines, N., Roulin, D., Francis, N., McNaught, C. E., MacFie, J., Liberman, A. S., Soop, M., Hill, A., Kennedy, R. H., Lobo, D. N., Fearon, K. C. H., & Ljungqvist, O. (2012). Guidelines for perioperative care in elective colonic surgery: Enhanced Recovery After Surgery Society recommendations. Clinical Nutrition, 31(6), 783–800. https://doi.org/10.1016/j.clnu.2012.08.013

Kehlet, H., & Wilmore, D. W. (2002). Multimodal strategies to improve surgical outcome. The American Journal of Surgery, 183(6), 630–641. https://doi.org/10.1016/S0002-9610(02)00866-8

Li, L., Jin, J., Min, S., Liu, D., Liu, L., & Yu, D. (2017). Application of enhanced recovery after surgery in gastrectomy: A systematic review and meta-analysis. Medicine, 96(31), e8432. https://doi.org/10.1097/MD.0000000000008432

Ljungqvist, O., Scott, M., & Fearon, K. C. H. (2017). Enhanced recovery after surgery: A review. JAMA Surgery, 152(3), 292–298. https://doi.org/10.1001/jamasurg.2016.4952

Melnyk, M., Casey, R. G., Black, P., & Koupparis, A. J. (2011). Enhanced recovery after surgery (ERAS) protocols: Time to change practice? Canadian Urological Association Journal, 5(5), 342–348. https://doi.org/10.5489/cuaj.11002

Qin, X., Yin, Y., Liu, L., Zhang, Y., Wang, J., & Li, Y. (2024). A retrospective cohort study on enhanced recovery after surgery (ERAS) in patients with diabetic foot ulcer. Scientific Reports, 14, 18171. https://doi.org/10.1038/s41598-024-69150-8

Ripollés-Melchor, J., Ramírez-Rodríguez, J. M., Casans-Francés, R., Aldecoa, C., Abad-Motos, A., Logroño-Egea, M., García-Erce, J. A., Camps-Cervantes, A., Ferrando, C., & POWER Study Investigators Group. (2019). Association between use of enhanced recovery after surgery protocol and postoperative complications in colorectal surgery. JAMA Surgery, 154(8), 725–736. https://doi.org/10.1001/jamasurg.2019.0995

Wang, B., Wang, Y., Huang, J., Wang, P., Yao, D., Huang, Y., Zhou, Z., Zhen, L., Yu, C., Xie, T., & Li, Y. (2024). Impact of enhanced recovery after surgery (ERAS) on surgical site infection and postoperative recovery outcomes: A retrospective study of 1276 cases. Scientific Reports, 14, 24055. https://doi.org/10.1038/s41598-024-74389-2

Weets, V., Meillat, H., Saadoun, J. E., Dazza, M., de Chaisemartin, C., & Lelong, B. (2024). Impact of an enhanced recovery after surgery (ERAS) program on the management of complications after laparoscopic or robotic colectomy for cancer. Annals of Coloproctology, 40(5), 440–450. https://doi.org/10.3393/ac.2023.00850.0121

Wu, C. L., King, A. B., Geiger, T. M., Grant, M. C., Grocott, M. P. W., Gupta, R., Miller, T. E., Thacker, J. K. M., & American Society for Enhanced Recovery and Perioperative Quality Initiative. (2019). American Society for Enhanced Recovery and Perioperative Quality Initiative joint consensus statement on perioperative opioid minimization in opioid-naïve patients. Anesthesia & Analgesia, 129(2), 567–577. https://doi.org/10.1213/ANE.0000000000004063

Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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