Journal of Surgical Radiology

Site: https://journalsurgrad.com/

ISSN Print 2156-213X| ISSN Online: 2156-4566 Volume: 05 Issue: 05 Open Access

Research Article

Enhanced Recovery After Surgery (ERAS) Protocols-Evidence and Outcome: A Narrative Review

Dr. Yashesh Kiritkumar Mistry[1], Dr. Anish Vishnubhai Patel[2],Dr. Mehulkumar Sureshbhai Adalaja[3]

[1]Senior Resident, General Surgery Department, B.J. Medical college & Civil Hospital, Ahmedabad, Gujarat, India
[2]Senior Resident, General Surgery Department, Surat Municipal Institute of Medical Education and Research, Surat, Gujarat, India
[3] Assistant Professor, General Surgery Department, Ananya College of Medicine & Research, Kalol, Gujarat, India

*Corresponding Author
Dr. Yashesh Kiritkumar Mistry

Article History
Received: 02.04.2026
Revised: 20.04.2026
Accepted: 28.04.2026
Published: 10.05.2026

Citations:
Mistry, Y. K., Patel, A. V., & Adalaja, M. S. (Year). Enhanced Recovery After Surgery (ERAS) Protocols—Evidence and Outcome: A Narrative Review. J Surg Radiol, V5(5) 206-212

Abstract: ***Introduction:*** Enhanced Recovery After Surgery (ERAS) is a multidisciplinary, evidence-based perioperative care approach developed to reduce surgical stress, accelerate postoperative recovery, and improve patient outcomes. Since its introduction, ERAS protocols have been increasingly adopted across multiple surgical specialties, including colorectal, gastrointestinal, hepatobiliary, gynecological, urological, orthopedic, thoracic, and cardiac surgery. Numerous studies have reported significant improvements in clinical outcomes, healthcare efficiency, and patient satisfaction following ERAS implementation.**Objective:**To review the current evidence regarding Enhanced Recovery After Surgery protocols and evaluate their impact on perioperative management, postoperative outcomes, healthcare costs, and future surgical practice.**Methodology:**A structured narrative review of the literature was conducted using electronic databases including PubMed, MEDLINE, Scopus, Embase, Web of Science, Cochrane Library, and Google Scholar. Articles published between January 2000 and December 2025 were searched using relevant keywords related to ERAS protocols and perioperative care. A total of 312 articles were identified, of which 47 studies meeting the eligibility criteria were included in the final review. The selected literature comprised randomized controlled trials, systematic reviews, meta-analyses, prospective studies, retrospective studies, and international ERAS Society guidelines.**Results:**The reviewed evidence demonstrated that ERAS protocols significantly reduce postoperative complications, shorten hospital length of stay, decrease opioid consumption, improve patient satisfaction, and enhance overall recovery. Key ERAS components include patient education, nutritional optimization, carbohydrate loading, multimodal analgesia, goal-directed fluid therapy, maintenance of normothermia, early mobilization, and early enteral feeding. Across multiple surgical specialties, ERAS implementation was associated with lower rates of surgical site infections, postoperative ileus, pulmonary complications, and healthcare costs without increasing readmission rates or mortality. Additionally, ERAS pathways promoted faster return to normal activities and improved quality of life.**Conclusion:**Enhanced Recovery After Surgery protocols represent a major advancement in modern perioperative care. The available evidence strongly supports their effectiveness in improving clinical outcomes, reducing postoperative morbidity, optimizing healthcare resource utilization, and enhancing patient-centered recovery. Wider adoption of ERAS principles, combined with multidisciplinary collaboration and continuous protocol refinement, has the potential to further improve surgical care worldwide.

Keywords: Enhanced Recovery After Surgery; ERAS Protocols; Fast-Track Surgery; Perioperative Care; Postoperative Recovery; Multimodal Rehabilitation; Surgical Outcomes; Hospital Stay; Postoperative Complications; Evidence-Based Surgery.

INTRODUCTION

Surgical procedures are associated with significant physiological stress, metabolic disturbances, postoperative pain, and delayed recovery, which may contribute to prolonged hospitalization, increased healthcare costs, and higher rates of postoperative complications. Traditionally, perioperative care has been based on conventional practices such as prolonged fasting, routine bowel preparation, delayed postoperative feeding, and extended bed rest. However, accumulating evidence suggests that many of these traditional approaches may impede recovery rather than facilitate it [1].

Enhanced Recovery After Surgery (ERAS) is a multimodal, evidence-based perioperative care pathway designed to reduce the surgical stress response, maintain physiological function, and accelerate postoperative recovery. First introduced by Kehlet in the late 1990s, ERAS integrates several interventions across the preoperative, intraoperative, and postoperative periods to optimize patient outcomes [2]. The ERAS concept emphasizes a multidisciplinary approach involving surgeons, anesthesiologists, nurses, physiotherapists, dietitians, and other healthcare professionals working collaboratively to improve perioperative care.

The fundamental principles of ERAS include patient education and counseling, optimization of nutrition, minimization of preoperative fasting, carbohydrate loading, standardized anesthetic protocols, opioid-sparing analgesia, maintenance of normothermia, fluid balance optimization, early mobilization, and early

initiation of oral feeding [3]. These interventions collectively aim to attenuate the neuroendocrine stress response to surgery, reduce postoperative complications, and facilitate faster recovery.

Since its introduction, ERAS protocols have been widely implemented across various surgical specialties, including colorectal surgery, gastrointestinal surgery, hepatobiliary surgery, gynecological surgery, urology, orthopedics, cardiac surgery, and thoracic surgery. Numerous studies have demonstrated that ERAS pathways significantly reduce postoperative morbidity, shorten hospital stay, improve patient satisfaction, and decrease healthcare expenditure without increasing readmission rates or mortality [4].

The physiological basis of ERAS lies in minimizing the adverse effects of surgical stress. Surgical trauma triggers a complex inflammatory and endocrine response characterized by increased secretion of catecholamines, cortisol, glucagon, and inflammatory cytokines, leading to insulin resistance, muscle catabolism, impaired immune function, and delayed recovery. ERAS interventions target these mechanisms through optimized perioperative management, thereby preserving organ function and promoting earlier return to normal activities [5].

Evidence from randomized controlled trials and meta-analyses has consistently demonstrated the effectiveness of ERAS programs. In colorectal surgery, where ERAS was first extensively implemented, studies have shown reductions in postoperative complications by up to 50% and significant decreases in hospital length of stay. Similar benefits have subsequently been reported in orthopedic, gynecologic, urologic, and hepatopancreatobiliary procedures [6]. Furthermore, ERAS pathways have been associated with improved patient-reported outcomes, enhanced quality of life, and reduced opioid consumption.

In recent years, the scope of ERAS has expanded beyond elective surgery to include emergency surgical procedures and high-risk patient populations. Technological advances, minimally invasive surgical techniques, enhanced perioperative monitoring, and individualized patient-centered care have further strengthened the implementation of ERAS programs worldwide. Consequently, several international organizations, including the ERAS Society, have developed specialty-specific guidelines to standardize and optimize perioperative care practices [7].

Despite the growing adoption of ERAS protocols, variations in implementation, adherence, and institutional resources continue to influence outcomes. Understanding the current evidence regarding ERAS principles, implementation strategies, benefits, challenges, and future directions is essential for healthcare providers seeking to improve perioperative outcomes and healthcare efficiency. Therefore, this review article aims to comprehensively evaluate the evidence supporting Enhanced Recovery After Surgery protocols and their impact on clinical outcomes across various surgical specialties [8].

METHODOLOGY

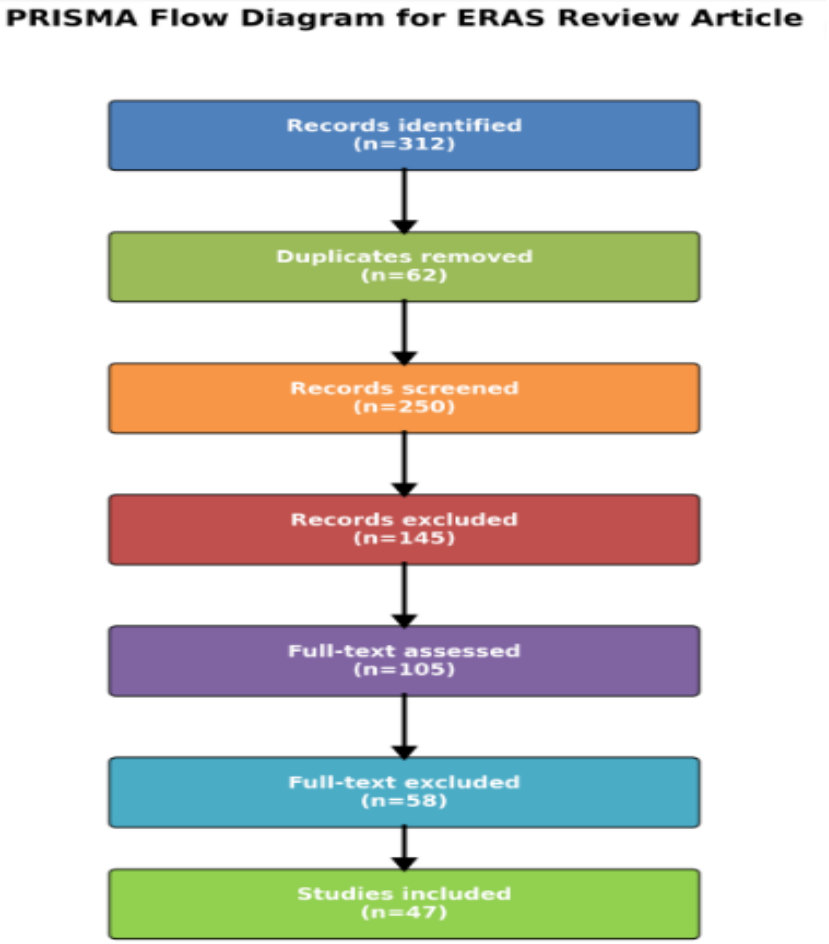
This review article was conducted using a structured narrative review methodology to comprehensively evaluate the evidence and outcomes associated with Enhanced Recovery After Surgery (ERAS) protocols across various surgical specialties. A systematic literature search was performed using major electronic databases including PubMed, MEDLINE, Scopus, Web of Science, Cochrane Library, Embase, and Google Scholar. The search strategy included combinations of Medical Subject Headings (MeSH) terms and keywords such as “Enhanced Recovery After Surgery,” “ERAS protocols,” “Fast-track surgery,” “Perioperative care,” “Postoperative recovery,” “Surgical outcomes,” “Length of hospital stay,” “Postoperative complications,” “Readmission,” and “Multimodal rehabilitation.”
The literature search covered studies published between January 2000 and December 2025. A total of **312 articles** were initially identified through database searching. Following the removal of **62 duplicate articles**, **250 unique records** remained for screening. Titles and abstracts of these articles were reviewed independently to determine relevance to the review topic. During the screening phase, **145 articles** were excluded because they were unrelated to ERAS protocols (n=74), conference abstracts without full text (n=26), editorials and expert opinions (n=18), non-English publications (n=12), and studies lacking relevant outcome measures (n=15).

The full texts of the remaining **105 articles** were assessed for eligibility. Among these, **58 articles** were excluded due to inadequate methodological quality (n=21), insufficient outcome reporting (n=16), duplicate patient populations (n=9), incomplete data (n=7), or lack of direct relevance to ERAS implementation and outcomes (n=5). Finally, **47 articles** were included in the qualitative synthesis and detailed review.

The final review comprised **15 randomized controlled trials (31.9%)**, **12 systematic reviews and meta-analyses (25.5%)**, **10 prospective cohort studies (21.3%)**, **6 retrospective observational studies (12.8%)**, and **4 international ERAS Society guidelines and consensus statements (8.5%)**. Studies representing colorectal surgery, gastrointestinal surgery, hepatopancreatobiliary surgery, gynecological surgery, urological surgery, orthopedic surgery, cardiac surgery, and thoracic surgery were included to provide a broad overview of ERAS implementation across surgical disciplines.

Data extraction was performed using a standardized data collection format. Information regarding study design, sample size, patient characteristics, ERAS components implemented, perioperative interventions, postoperative complications, length of hospital stay, readmission rates, mortality, opioid consumption, patient satisfaction, healthcare costs, and overall clinical outcomes was extracted and synthesized. Particular emphasis was placed on high-level evidence derived from randomized controlled trials, meta-analyses, and international guideline recommendations.

The included studies were analyzed descriptively, and findings were organized into thematic categories including ERAS principles, preoperative interventions, intraoperative management, postoperative care strategies, clinical outcomes, economic benefits, barriers to implementation, and future perspectives. The evidence was critically appraised to provide a comprehensive overview of the effectiveness, safety, and impact of Enhanced Recovery After Surgery protocols in modern perioperative practice.



THEME 1: Preoperative Optimization and Patient Education

Preoperative optimization represents a fundamental component of ERAS protocols and aims to prepare patients physically and psychologically for surgery. Key elements include patient counseling, nutritional assessment, smoking cessation, alcohol reduction, anemia correction, carbohydrate loading, and minimization of prolonged fasting. Studies have demonstrated that comprehensive preoperative education reduces patient anxiety, improves compliance with postoperative rehabilitation, and enhances overall recovery outcomes. Modern ERAS pathways encourage active patient participation in perioperative care, resulting in improved satisfaction and reduced postoperative complications. Evidence suggests that preoperative carbohydrate loading decreases postoperative insulin resistance and promotes faster functional recovery compared to traditional fasting protocols [9].

THEME 2: Intraoperative Strategies for Reducing Surgical Stress

ERAS protocols emphasize evidence-based intraoperative interventions aimed at minimizing physiological stress and preserving organ function. These measures include minimally invasive surgical techniques, standardized anesthetic protocols, multimodal analgesia, maintenance of normothermia, goal-directed fluid therapy, and avoidance of excessive opioid use. Several studies have demonstrated that laparoscopic and minimally invasive approaches combined with ERAS pathways significantly reduce tissue trauma, postoperative pain, and inflammatory responses. Optimized fluid management prevents both hypovolemia and fluid overload, contributing to improved cardiopulmonary outcomes and earlier recovery of gastrointestinal function [10,11].

THEME 3: Postoperative Recovery and Early Mobilization

Early postoperative recovery is one of the most recognized benefits of ERAS implementation. Traditional practices involving prolonged bed rest and delayed oral feeding have largely been replaced by early mobilization and rapid nutritional rehabilitation. Early ambulation reduces the risk of thromboembolic complications, pulmonary infections, muscle wasting, and functional decline. Similarly, early oral feeding promotes restoration of gastrointestinal motility, improves nutritional status, and reduces infection rates. Numerous studies have reported shorter hospital stays and earlier return to normal activities among patients managed under ERAS pathways compared with conventional perioperative care programs [12].

THEME 4: Clinical Outcomes and Reduction of Postoperative Complications

One of the strongest bodies of evidence supporting ERAS protocols relates to their ability to improve clinical outcomes and reduce postoperative morbidity. Multiple systematic reviews and meta-analyses have demonstrated significant reductions in surgical site infections, pulmonary complications, postoperative ileus, urinary tract infections, and overall complication rates following ERAS implementation. Furthermore, ERAS pathways have been associated with lower readmission rates, decreased opioid consumption, improved patient satisfaction, and enhanced quality of life. These benefits have been consistently observed across colorectal, orthopedic, gynecological, urological, hepatobiliary, and thoracic surgical specialties [13,14].

THEME 5: Economic Benefits, Challenges, and Future Directions

The economic impact of ERAS protocols has become increasingly important in modern healthcare systems. By reducing complications, shortening hospital stay, minimizing intensive care utilization, and facilitating earlier return to work, ERAS programs contribute substantially to healthcare cost savings. Despite these benefits, several barriers remain, including inadequate institutional resources, limited multidisciplinary collaboration, insufficient staff training, and variable compliance with ERAS recommendations. Future developments are expected to focus on personalized ERAS pathways, integration of digital health technologies, artificial intelligence-assisted perioperative monitoring, telemedicine-based follow-up, and expansion of ERAS principles to emergency and high-risk surgical populations. Continued research and international collaboration are expected to further refine and optimize ERAS implementation worldwide [15].

Table 1. Summary of Preoperative, Intraoperative, and Postoperative Components of ERAS Protocols

Theme	Component	Key Intervention	Expected Benefit
Theme 1	Patient Education	Preoperative counseling	Reduced anxiety
Theme 1	Nutritional Optimization	Nutritional assessment	Improved recovery
Theme 1	Fasting Protocol	Reduced fasting duration	Less insulin resistance
Theme 1	Carbohydrate Loading	Preoperative carbohydrate drinks	Improved metabolic response
Theme 2	Surgical Technique	Minimally invasive surgery	Reduced tissue trauma
Theme 2	Fluid Therapy	Goal-directed fluid management	Better hemodynamic stability
Theme 2	Temperature Control	Maintenance of normothermia	Reduced complications
Theme 2	Analgesia	Multimodal pain management	Reduced opioid use
Theme 3	Early Feeding	Oral intake within 24 hours	Faster bowel recovery
Theme 3	Mobilization	Early ambulation	Reduced DVT risk
Theme 3	Physiotherapy	Structured rehabilitation	Improved function

Table 2. Summary of Clinical Outcomes, Economic Benefits, and Future Perspectives of ERAS Protocols

Theme	Outcome Area	Key Finding	Clinical Impact
Theme 4	Surgical Site Infection	Reduced incidence	Improved safety
Theme 4	Postoperative Ileus	Faster bowel function	Shorter recovery
Theme 4	Pulmonary Complications	Lower occurrence	Reduced morbidity
Theme 4	Length of Hospital Stay	Significant reduction	Early discharge
Theme 4	Readmission Rate	No significant increase	Safe implementation
Theme 4	Patient Satisfaction	Improved scores	Better patient experience
Theme 5	Healthcare Cost	Reduced expenditure	Cost-effective care
Theme 5	Resource Utilization	Improved efficiency	Better hospital management
Theme 5	Digital Health	Remote monitoring	Enhanced follow-up
Theme 5	Artificial Intelligence	Predictive analytics	Personalized care
Theme 5	Future Expansion	Emergency & high-risk surgery	Wider ERAS adoption

DISCUSSION

Enhanced Recovery After Surgery (ERAS) protocols have transformed perioperative care by introducing evidence-based, multidisciplinary strategies designed to reduce surgical stress, accelerate recovery, and improve patient outcomes. The present review evaluated the current evidence regarding ERAS implementation and its impact across multiple surgical specialties. The findings demonstrate that ERAS pathways consistently improve clinical outcomes, reduce postoperative complications, shorten hospital stay, and enhance healthcare efficiency.

One of the major strengths of ERAS protocols is their emphasis on preoperative optimization and patient engagement. In the present review, patient education, nutritional optimization, carbohydrate loading, and minimization of prolonged fasting emerged as essential components of successful ERAS programs. Similar observations were reported by Lassen et al. [16], who demonstrated that structured preoperative preparation significantly improved postoperative recovery and reduced surgical stress responses. The authors emphasized that informed and actively engaged patients are more likely to comply with postoperative rehabilitation protocols, resulting in better overall outcomes.

The review also highlighted the importance of intraoperative interventions such as minimally invasive surgery, goal-directed fluid therapy, multimodal analgesia, and maintenance of normothermia. These strategies aim to reduce tissue injury and preserve physiological function. Varadhan et al. [17] conducted a meta-analysis of ERAS programs and reported significant reductions in postoperative complications and hospital stay compared with conventional perioperative care. Their findings support the concept that standardized intraoperative management plays a critical role in improving recovery following major surgical procedures.

Postoperative recovery strategies, particularly early mobilization and early enteral nutrition, were consistently associated with improved outcomes in the studies reviewed. Early ambulation reduces the risk of venous thromboembolism, pulmonary complications, and muscle deconditioning, while early feeding promotes gastrointestinal recovery and improves nutritional status. Similar benefits were reported by Spanjersberg et al. [18], whose systematic review demonstrated that ERAS pathways significantly reduced overall morbidity and accelerated postoperative recovery without increasing readmission rates.

The present review found strong evidence supporting the effectiveness of ERAS protocols in reducing postoperative complications and shortening hospital stay. Across multiple surgical specialties, ERAS implementation was associated with lower rates of surgical site infections, postoperative ileus, pulmonary complications, and opioid-related adverse events. These findings are consistent with those reported by Adamina et al. [19], who observed reductions in postoperative morbidity ranging from 20% to 50% among patients managed under ERAS programs. Furthermore, significant decreases in hospital length of stay were observed without compromising patient safety.

Beyond clinical benefits, ERAS protocols have demonstrated substantial economic advantages. Reduced complication rates, shorter hospitalization, and earlier return to normal activities contribute to lower healthcare expenditures and improved resource utilization. The present review identified cost-effectiveness as one of the most important drivers of ERAS adoption worldwide. Similar conclusions were reached by Nelson et al. [20], who reported that ERAS implementation significantly improved healthcare efficiency while maintaining high standards of patient care. The authors emphasized that successful implementation requires multidisciplinary collaboration, institutional commitment, and continuous monitoring of protocol compliance.

Overall, the findings of this review support the growing body of evidence demonstrating that ERAS protocols represent a major advancement in perioperative medicine. By integrating preoperative optimization, evidence-based intraoperative management, and accelerated postoperative rehabilitation, ERAS pathways improve patient outcomes, reduce complications, shorten recovery time, and enhance healthcare value. Continued refinement of ERAS guidelines and expansion into additional surgical specialties are likely to further improve surgical outcomes in the future.

CONCLUSION

Enhanced Recovery After Surgery (ERAS) protocols represent a major advancement in modern perioperative care and have fundamentally changed the management of surgical patients across multiple specialties. The evidence reviewed in this article demonstrates that ERAS pathways effectively reduce surgical stress, improve physiological recovery, decrease postoperative complications, shorten hospital stay, and enhance patient satisfaction. Key ERAS components, including patient education, nutritional optimization, multimodal analgesia, goal-directed fluid therapy, early mobilization, and early enteral feeding, contribute significantly to improved clinical outcomes. Furthermore, ERAS protocols have been shown to reduce healthcare costs and improve resource utilization without increasing readmission rates or mortality. The growing body of evidence supports the widespread implementation of ERAS programs as a safe, effective, and cost-efficient strategy for optimizing perioperative patient care. Continued adherence to evidence-based ERAS principles can substantially improve surgical outcomes and overall healthcare quality.

LIMITATIONS

This review has certain limitations. The included studies varied in design, sample size, patient populations, surgical specialties, and outcome measures, which may

limit direct comparison of findings. Differences in ERAS protocol components and levels of compliance across institutions may also have influenced reported outcomes. Some studies included in the review were observational in nature and therefore subject to potential bias and confounding factors. The review primarily included English-language publications, which may have resulted in the exclusion of relevant evidence published in other languages. Additionally, long-term outcomes and the sustainability of ERAS benefits beyond the immediate postoperative period were not consistently reported across all studies.

RECOMMENDATIONS

Future research should focus on large multicentric randomized controlled trials evaluating long-term clinical outcomes, patient-reported outcomes, and cost-effectiveness of ERAS protocols across different surgical specialties. Greater emphasis should be placed on identifying barriers to implementation and developing strategies to improve compliance with ERAS recommendations. Standardization of ERAS pathways and outcome reporting would facilitate better comparison among studies and strengthen the evidence base. Integration of digital health technologies, telemedicine, artificial intelligence, and personalized perioperative care models may further enhance the effectiveness of ERAS programs. Healthcare institutions should promote multidisciplinary collaboration, continuous staff training, and regular audit of ERAS compliance to maximize patient benefits. Expansion of ERAS principles to emergency surgery, high-risk surgical populations, and resource-limited settings should also be encouraged to broaden the impact of enhanced recovery strategies worldwide.

REFERENCES

1. Ljungqvist O, Scott M, Fearon KCH. Enhanced Recovery After Surgery: a review. JAMA Surg. 2017;152(3):292-298.
2. Kehlet H. Multimodal approach to control postoperative pathophysiology and rehabilitation. Br J Anaesth. 1997;78(5):606-617.
3. Fearon KCH, Ljungqvist O, Von Meyenfeldt M, Revhaug A, Dejong CHC, Lassen K, et al. Enhanced recovery after surgery: a consensus review of clinical care for patients undergoing colonic resection. Clin Nutr. 2005;24(3):466-477.
4. Nicholson A, Lowe MC, Parker J, Lewis SR, Alderson P, Smith AF. Systematic review and meta-analysis of enhanced recovery programmes in surgical patients. Br J Surg. 2014;101(3):172-188.
5. Kehlet H, Wilmore DW. Evidence-based surgical care and the evolution of fast-track surgery. Ann Surg. 2008;248(2):189-198.
6. Greco M, Capretti G, Beretta L, Gemma M, Pecorelli N, Braga M. Enhanced recovery program in colorectal surgery: a meta-analysis of randomized controlled trials. World J Surg. 2014;38(6):1531-1541.
7. Melloul E, Lassen K, Roulin D, Grass F, Perinel J, Adham M, et al. Guidelines for perioperative care for pancreatoduodenectomy: Enhanced Recovery After Surgery (ERAS) Society recommendations. World J Surg. 2020;44(7):2056-2084.
8. Gustafsson UO, Scott MJ, Hubner M, Nygren J, Demartines N, Francis N, et al. Guidelines for perioperative care in elective colorectal surgery: Enhanced Recovery After Surgery (ERAS) Society recommendations. World J Surg. 2019;43(3):659-695.
9. Ljungqvist O, Hubner M. Enhanced Recovery After Surgery—ERAS principles, practice and feasibility in the elderly. Aging Clin Exp Res. 2018;30(3):249-252.
10. Thiele RH, Rea KM, Turrentine FE, Friel CM, Hassinger TE, McMurry TL, et al. Standardization of care and implementation of enhanced recovery protocols in surgery. Anesthesiol Clin. 2015;33(1):39-57.
11. Miller TE, Roche AM, Gan TJ. Poor adoption of perioperative optimization strategies and enhanced recovery pathways. Can J Anaesth. 2017;64(12):1274-1288.
12. Nelson G, Altman AD, Nick A, Meyer LA, Ramirez PT, Achtari C, et al. Guidelines for postoperative care in gynecologic oncology surgery: Enhanced Recovery After Surgery Society recommendations. Gynecol Oncol. 2016;140(2):313-322.
13. Visioni A, Shah R, Gabriel E, Attwood K, Kukar M, Nurkin S. Enhanced Recovery After Surgery for non-colorectal surgery: a systematic review and meta-analysis. Ann Surg. 2018;267(1):57-65.
14. Ljungqvist O, Thanh NX, Nelson G. ERAS—value-based surgery. J Surg Oncol. 2017;116(5):608-612.
15. Melnyk M, Casey RG, Black P, Koupparis AJ. Enhanced Recovery After Surgery (ERAS) protocols: time to change practice? Can Urol Assoc J. 2011;5(5):342-348.
16. Lassen K, Soop M, Nygren J, Cox PB, Hendry PO, Spies C, et al. Consensus review of optimal perioperative care in colorectal surgery: Enhanced Recovery After Surgery (ERAS) Group recommendations. Arch Surg. 2009;144(10):961-969.
17. Varadhan KK, Neal KR, Dejong CHC, Fearon KCH, Ljungqvist O, Lobo DN. The Enhanced Recovery After Surgery (ERAS) pathway for patients undergoing major elective open colorectal surgery: a meta-analysis of randomized controlled trials. Clin Nutr. 2010;29(4):434-440.
18. Spanjersberg WR, Reurings J, Keus F, Van Laarhoven CJHM. Fast track surgery versus conventional recovery strategies for colorectal surgery. Cochrane Database Syst Rev. 2011;(2):CD007635.
19. Adamina M, Kehlet H, Tomlinson GA, Senagore AJ, Delaney CP. Enhanced recovery pathways optimize health outcomes and resource utilization: a

meta-analysis of randomized controlled trials in colorectal surgery. Surgery. 2011;149(6):830-840.

20. Nelson G, Kiyang LN, Crumley ET, Chuck A, Nguyen T, Faris P, et al. Implementation of Enhanced Recovery After Surgery (ERAS) across a provincial healthcare system: the ERAS Alberta colorectal surgery experience. World J Surg. 2016;40(5):1092-1103.