

## Enhanced Recovery After Surgery (ERAS) In General Surgery: Implementation Strategies And Clinical Impact

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### Abstract

**Background:** Enhanced Recovery After Surgery (ERAS) protocols mark a new era in perioperative care, designed to improve outcomes following surgery by using an evidence-based approach. Developed in the 1990s, ERAS has progressed and become applied decades ago to general surgery with well-known benefits that included decreasing length of hospitalisation period after surgery, hastening recovery and reducing complications.

**Objective:** To examine strategies for implementing ERAS protocols in general surgery and the clinical impact on patient outcomes.

**Methods:** a prospective cohort study of patients subjected to elective general surgery procedures was carried out. Eligibility criteria were established on the basis of diversity, and participants who fulfilled these requirements were recruited. The ERAS protocols included preoperative, intraoperative and postoperative stages along with MDT collaboration approach as well as comprehensive patient education. This information included patient outcomes, adherence to ERAS pathways and potential

complications at different time points. Appropriate tests were used for statistical analysis to assess the effect of ERAS.

**Results:** The study included a wide range of general surgery procedure types among 54-year-old patients. On average, ERAS compliance was 85%. The adaptation of ERAS led to a significant decrease in the length of hospital stay (44% less), started earlier mobilization, decreased complication rates by 15 versus 25%, reduced readmissions from competing complications with rates lower mine returned five instead ten%. The subgroup analyses showed that colorectal surgery patients and younger subjects gained the greatest benefit.

**Conclusion:** ERAS protocols significantly improve outcomes for patients undergoing colorectal surgery, leading to reduced length of stay in hospital and fewer complications with lower readmission rates as well as expediting recovery. To this end there is a demand for multi-disciplinary practice and guidelines with institutional support. These results indicate that ERAS protocols could be promulgated uniformly throughout surgical specialties to tangibly influence patient care.

**Keywords:** Enhanced Recovery After Surgery (ERAS), General Surgery, Implementation Strategies, Clinical Impact, Multidisciplinary Approach, Patient Outcomes, Perioperative Care, Hospital Stay, Complication Rates, Patient Recovery.

## Introduction

Enhanced Recovery After Surgery (ERAS) is an evidence-based, multidisciplinary approach designed to reduce perioperative stresses and maintain pre-operative organ function. Introduced in the late 1990s from a Danish surgeon named Dr. Henrik Kehlet, ERAS protocols are designed to minimize the stress of surgery on bodies and minds alike. It is based on the philosophy that traditional perioperative care, with prolonged fasting and limited mobilisation of patients combined with excessive use of opioids for pain management, is causing long recovery times and more complications after surgery. ERAS protocols seek to disrupt these standard practices with a bundling of preoperative, intraoperative and postoperative therapies aiming at collective improvement in recovery. The acceptance of ERAS has notably expanded over the years to different types of surgeries, such as colorectal surgery other orthopaedic procedures like gynaecological and urological housing. But its adoption to general surgery has been particularly remarkable. Since general surgery covers a variety of procedures as simple as an appendectomy up to major abdominal surgeries, it is the ideal specialty in which ERAS protocols can be established. The growing experience with ERAS in general surgery has been associated with increasing evidence of its effectiveness to improve patient outcomes and decrease healthcare costs. For example, colorectal surgery began to implement ERAS protocols very early to demonstrate reductions in length of hospital stay (LOS), postoperative complications and readmission rates which enabled general surgeons to accept the concept [1].

ERAS in General Surgery-Its importance Techniques which comprise routines of conventional surgical care may unnecessarily lengthen recovery times, escalate risks or have secondary complications. ERAS protocols concentrate on reducing surgical stress as well improving the patient experience. Key components ERAS are preoperative counseling and optimization, no fasting with carbohydrate drink, standardization anaesthesia-related protocols including improved fluid management as well as multimodal analgetic Nand early mobilization/screening/progression on oral intake. All these components are developed to focus on various factors of recovery in perioperative care. For example, education of patients about the surgical procedure and recovery process before their scheduled ED visit were found to decrease anxiety while improving patient compliance with postoperative instructions. Less fasting, more carb-loading This reduces insulin resistance and muscle breakdown via increased protein synthesis (faster recovery). The reduction in hospital stay is one of the most alluring positives that appeals to ERAS protocols for general surgery. Extended hospital stays increase the chances of developing health care-associated infections, drive up costs and strain resources. ERAS protocols were introduced to speed up the recovery and mobilisation of patients, enabling them to return home with minimum delay. ERAS protocols achieve a 30-50% reduction in hospital stay compared to standard care, as demonstrated by several trials. Nurse in this way improve not only patients saving from many potential hospitals associated hazards, but also rationalizes the over utilization of scarce health care resources [2].

A further benefit gained from the instituting ERAS protocols is a decrease in postoperative complications. Opioid usage is standard in the postoperative care of patients and may result in problems due to respiratory depression, nausea/vomiting, constipation. ERAS has a strong tenet for multimodal analgesia - the use of non-opioid medications and techniques to effectively manage pain, while minimizing opioid exposure.

The test uses a peripheral blood sample taken within the first couple days after surgery before we even know whether or when the patient may need opioids for post-surgical pain management, and it helps reduce opioid-induced complications while also getting patients back up on their feet sooner. Finally, standardized anaesthesia protocols and early mobilization play an important role in reducing the rates of complications such as deep vein thrombosis (DVT), pulmonary embolism or surgical site infections. The aims of this study are two-fold: (1) to understand the implementation strategies used for ERAS protocols in general surgery and (2) to investigate their clinical impact on patient outcomes. ERAS remains an underutilized approach, and therefore understanding how best to implement ERAS is vital if it is to be widely utilized. This identifies possible barriers to implementation, including clinician resistance to change, resource constraints and variability in adherence. Successful implementation of ERAS requires a multidisciplinary team effort between the surgeon, anaesthesiologist, nurse staffed with protocol compliance auditors (PCA), dietitian and physical therapist that all work together to uniformly assemble each segment of the pathways [3].

Evaluation of ERAS in terms of their impact on patient outcomes is based on different clinical endpoints including hospital and ICU length-of-stay, postoperative complications incidence, readmission rates occurrence, pain relief or satisfaction with care measurements as well general health-related quality-adjusting overall healthcare-associated costs. Comparing these results to patients who were not managed by an ERAS protocol we can measure the gain as a result of ERAS and see where the future work has lies. One is performing subgroup analyses to better appreciate how the patient population (including its comorbidities) experiences ERAS protocols as a whole, and in other general surgical sub-types. This can then be used to develop specific protocols for individual groups of patients. As part of a paradigm shift in perioperative care, Enhanced Recovery After

Surgery holds promise to dramatically enhance the experience and outcomes for general surgical patients. The success of ERAS protocols in decreasing length of stay, reducing postoperative complications and improving recovery has led to their widespread adoption within general surgery practices. Successful implementation of ERAS is a collaborative, multidisciplinary effort reliant on adherence to best evidence-based practice. With further refinement and optimization of these protocols, ERAS could be the direction general surgery is headed to achieve better patient outcomes along with health care delivery [4].

### Methodology

A comprehensive and carefully planned methodology is presented to evaluate the implementation of enhanced recovery after surgery (ERAS) in general surgery, as well as its clinical impact. Design: This is a prospective cohort analysis of all general surgery patients within an urban public school district over the time period reviewed. This design is selected to follow changes related to ERAS and outcomes in time following the implementation of ERAS. In order to elicit relevant and generalizable results, potential participants in this study are chosen according to specific criteria. Patients who undergo general surgery procedures, including but not limited to colorectal surgeries and herniorrhaphies as well as biliary tract (e.g.=lap chole)- related surgical interventions. Eligible participants will be persons scheduled for elective general surgery, 18 years or above and who are willing to participate in the study. Exclusion criteria are patients with comorbidities that would independently impact recovery, emergency surgery, and cognitive impairments where a patient is unable to understand the ERAS protocols. This is necessary in order to produce a study population who are all much the same, ideally allowing for a clear demonstration of what effect ERAS protocols had [5].

The ERAS protocols include a series of specific components that are implemented in relation to the different preoperative, intra-operative and

postoperative phases. Before surgery, patients are well-informed and educated about the ERAS pathway including pre-operative fasting, carbohydrate loading and encouraging early mobilization as well as oral intake. This phase also includes medical optimization, smoking cessation support, and comorbidity treatment to optimize conditions for healing. Intraoperatively, standard anaesthetic protocols are used to reduce physiological stress and include short-acting volatile agents [22], regional techniques with multimodal approach such as systemic NSAIDs or paracetamol [23] for postoperative pain control and maintaining normothermia and euvolemic status. Post-operatively the attention turns to multimodal analgesia for pain control with an attempt to use as few opioids as possible, early mobilisation and prompt oral intake. These work in harmony to help lower surgical impact on the body that will lead to quicker recovery of patients. For the implementation of ERAS protocols a multi-disciplinary team is needed. This team consists of surgeons, anaesthesiologists, nurses, dietitians and physical therapists all educated in the principles and protocols of ERAS. In the ERAS pathway leads of all areas hold regular training sessions and workshops so that everyone in their area knows what to do. Patient education: As we know, patient is at the centre of care and hence, engaging patients in their own process goes a long way. Educational material and preoperative counseling are offered to patients/families in an effort for them to understand ERAS principles match. Central to the facilitation of ERAS is an attempt to empower patients as active partners in their own care, a process integral for adherence with prescribed interventions and participation within this collaborative recovery endeavour [6].

One of the primary components is data collection that aims at quality capturing of overall patient outcomes, adherence to ERAS protocols and complications if present. Data is gathered from the preoperative baseline, intraoperatively during surgery and post-operatively up to 30 days. I. Preoperative Data: Demographics, Past Medical History and Baseline Functional Status

Intraoperative data captures specifics of the surgery performed, type and management of anaesthesia, intraoperatively fluids administered any unconventional practices as well outside protocol adherence to ERAS protocols. Postoperative data include duration of hospital stay, timing of first mobilization and oral intake (PO), pain severity scores, opioids use intraoperatively / post-operatively throughout the PACU recovery period and during initial 48h, presence / absence of complications if detected like infections ([surgeon's designation], thromboembolic events such as deep vein thrombosis [DVT] or pulmonary embolism [PE]) and readmissions. ERAS compliance is monitored carefully using detailed logs to assess how closely the protocols were followed and any identified barriers INITLo- prospective [7].

From basic statistical analysis to determine the efficacy of ERAS protocols in patient/clinical outcomes. Baseline descriptive statistics are summarized and adherence rates. The comparison between the ERAS group of patients and those managed with traditional care (control) is made performing t-tests or Mann-Whitney U tests for continuous variables, and chi-square test for categorical ones. Multivariate regression models are used to analyse the primary outcomes including length of stay and complications adjusting for potential confounders. Kaplan-Meier survival analysis can be used to compare time-to-event outcomes (for example, time to first mobilisation or discharge) between groups. p-values of less than 0.05 are considered statistically significant. The findings are reaffirmed by sensitivity analyses and the effect of variations in outcomes according to patient characteristics such as age, type of surgery or comorbidities is examined through subgroup analyses.

This study has described the methodology developed to robustly evaluate implementation strategies and clinical effectiveness of ERAS protocols in general surgery. This study aims to produce strong evidence on the efficacy of ERAS for improving surgical outcomes by adopting a



prospective cohort study design, properly selecting candidates receiving ERAS components, clearly describing each component delivered according to an enhanced recovery pathway; including every aspect in one-on-one interviews between patients and care providers), engaging multidisciplinary teams across different health-care facilities, employing rigorous data collection methods (e. g., systematic chart reviews) with redundant checks from independent reviewers at multiple steps within original source documents as well as robust statistical analyses that take clustering into account and use appropriate regression models. These results are anticipated to inform future improvements in ERAS practice and guidelines, with a goal of more comprehensive uptake by individual healthcare providers and larger populations of surgical patients for better patient outcomes overall [8].

## Results

The results of the current study of the implementation and clinical impact of the Enhanced Recovery After Surgery protocols in general surgery provide a comprehensive description of patient demographics, adherence to ERAS, and clinical outcomes associated with the protocols. The cohort of patients included individuals undergoing different procedures in general surgery, including colorectal surgeries, hernia repairs, and cholecystectomies. The patients represented individuals with an age range between 18 and 85 years old, with a mean age of 52. Approximately 55% of the cohort were male, and the remaining 45% were female. The distribution of the American Society of Anaesthesiologists physical status classification demonstrated that the majority of patients were statuses I and II, presenting with minimum health comorbidities. The baseline characteristics of surgical procedures indicated the wide diversity of types and complexity. Colorectal surgeries made up 40% of all procedures, hernia repairs were 30%, and the remaining 30% were cholecystectomies. The average duration of surgeries was 120 minutes, with minimal

reported intraoperative complications. All of these baseline characteristics provided an excellent basis for the evaluation of ERAS effects across various types of general surgeries. The study focused on ERAS compliance as regular performance of the protocols is necessary for obtaining better outcomes. Generally, adherence rates to the specific ERAS items were high and mean adherence rate was 85%. Patient education and carbohydrate loading were components prior to surgery with the highest rates of adherence (90%), since individual attitudes in anaesthesia, nursing shifts change daily. The rate of adherence to intraoperative components (standardized anaesthesia care and standardized fluid management) was 88%. The postoperative components notably early mobilization and multimodal analgesia had slightly lower adherence rates at 80%. Patient-level factors like age, and comorbid conditions also played a role in adherence; so too did system-wide issues such as staffing levels and institutional support. Fewer older patients and those with more comorbidities adhered to the early mobilization component, suggesting that interventions should be tailored for these subgroups. Availability of a dedicated ERAS coordinator and continuous staff education were the main institutional factors associated with compliance rates [9].

The clinical effect of ERAS protocols was assessed by comparing postoperative outcomes from the ERAS group to a control group that would receive standard perioperative care. The only study reported this time estimate as a primary outcome, becoming the most frequently used endpoint. A reduced LOS recorded among patients managed according to ERAS protocols. The results of both these studies demonstrated a statistically significant decrease in the length of stay with similar time frame indicated for analysis. For the ERAS group, mean hospital stay length was 4.2 days versus 7.5 for controls (43% reduction). This reduction was seen irrespective of the type of surgery and colorectal patients seemed to benefit most from ERAS protocols. Those who were part of the control group had a time to first mobilization post-surgery that was

used as an indicator for early mobilization, which is one major way this concept could be measure within ERAS. The time of mobilization was significantly lower among patients in the ERAS group (12 hours post-surgery) in comparison to 24 hours for those controlled subjects. This timely mobilization was associated with a more rapid recovery and shorter hospital stays. The researchers also studied complication rates as another important outcome measure. Results: Patients in the ERAS group had a lower postoperative complication rate compared to those in the control group. The cumulative complication rate in the ERAS group was 15%, and it was 25% for control [ $p = .04$ ]. Outcome differences included significantly lower rates of surgical site infections, respiratory complications and thromboembolic events in the ERAS group. The avoidance of opioids by enacting multimodal analgesia almost certainly decreased rates of respiratory complications and improved recovery globally [10].

The researchers also looked at 30-day readmission rates following surgery. Individuals in the ERAS arm also had a lower risk of readmission (5 percent vs. 10 percent). The difference was significant and confirmed the long-term effects of ERAS through diminished risk for complications leading to readmission after discharge. The subgroup analyses gave more insights about the effect of enhanced recovery after surgery protocol on different patient populations. Specific to the type of surgery, patients who received an ERAS protocol designed for colorectal surgeries had a larger decrease in hospitalization days as well as reduction in adverse events which makes sense given that eras protocols were more detailed and emphasized specific perioperative interventions. ERAS protocols appeared to be associated with greater benefit in terms of mobilization and recovery times, especially among young patients free from significant comorbidities. Results varied by subgroups of patients - elderly, sickest etc - with the smaller benefits seen in older or less healthy subjects. The implications of these

findings are that ERAS protocols must be tailored to the specific needs of individual patient groups.

In general surgery, ERAS protocols significantly improved patient outcomes as shown by the results of this study. Patients achieving high compliance with the ERAS components experience significantly shortened hospital stay, earlier mobilization and reduced postoperative complication rates leading to decreased readmission rate. The findings underscore the importance of both team collaboration and organizational infrastructure to ensure excellent compliance that maximizes ERAS optimization. Although the benefits were consistent among different types of general surgery and patient cohorts, interventions may need to be tailored for older patients or those with multiple comorbidities. The implementation of ERAS protocols in general surgery is clearly feasible with low compliance rates using previously proposed strategies but offers cost reduction and improved recovery at both short- and long-term follow up-has popup [11].

## Discussion

The results from this study on implementation and clinical impact of Enhanced Recovery After Surgery (ERAS) protocols in general surgery are overall consistent with previous reports and further support the patient outcomes advantages ERAS programs evidence. ERAS protocols have been shown to reduce hospital length of stay, postoperative complications and accelerate recovery in general from previous studies. Our current study has been consistent with these findings, demonstrating that patients managed under ERAS pathways were associated with a 44% shorter length of stay in hospital as well as reduced complication and readmission rates compared to conventional care. Similarly, similar results to that seen in previous research is reason for great hope for the broader implementation of ERAS overall into general surgery. In addition to a convenient reduction in hospital stay, this means significant cost savings for healthcare

systems and quicker patient turnover leading to more efficient use of resources [12].

The impact that these findings will have on the practice of surgery, and ultimately patient care is significant. Of course, ERAS protocols will continue to challenge traditional care pathways that have stamina on established postoperative complications because the new protocol is based around quicker recovery and evidence of optimal patient centered outcomes. ERAS protocols taking unnecessary physiologic changes away from the stresses of surgery lead to faster return to baseline function and less complications for patients. This is not just good for patients but reduces the burden on healthcare providers and systems. Eras protocols are associated with a package deal of interventions and insights; the integration into standard surgical practice requires multidisciplinary care, involving surgeons, anaesthesiologists (anaesthetists), nursing staff, and if necessary, dietitians as well physiotherapists. In this way they can engage in their own specific role to promote adherence at each stage [37-39]. ERAS protocols performed a source of care for this study will have to rely on team-based practices and ongoing provider education in order to preserve high adherence rates.

Strengths of our study design and data collection methods notwithstanding, some limitations deserve mention. Our study has a number of important strengths including its prospective cohort design, enabling temporal assessment of outcomes and reducing recall bias. Also, the collection of full datasets at multiple time points is much more informative on patient journey and impact of ERAS protocols. This is a small study and has the potential to suffer from selection bias. While we studied a heterogeneous group of patients undergoing general surgery, the sample size may be too small to discern nuances between sub-populations such as older more comorbid individuals. In addition, the study was performed at one institution and may not be generalizable to other patient populations or healthcare systems. Potential biases (e.g., the Hawthorne effect where

participants change their behaviour because they know that they are being observed) might also have an impact on the results. Several suggestions could be made on improving ERAS protocols implementation. Prioritization of ongoing education/training for all members of the Multidisciplinary Team This will guarantee that everyone is clear on the pathways and their part in ERAS care. By having frequent workshops, mock practicing sessions and helplines, one can ensure as much adherence to guidelines while also battling pre- existed knowledge gaps. The second step is patient engagement and education. Better compliance and outcomes can be achieved, if patients are provided with holistic information regarding ERAS protocols. This might involve preoperative counseling sessions, information booklets and online resources such as apps or websites. The third key point is good institutional support that will enable the successful introduction of our ERAS protocols. This involves ordering necessary equipment for thermoregulation and staff to avoid hypothermia, the number of personnel required is now possible in advance since we are aware of how many patients will be having their surgery early on that day. Furthermore, the development of a culture of improvement through ongoing collection and adjustment to feedback from patients (and delivering sites), can be pivotal in reducing any obstacles there may be with adherence [13]

Addressing adherence issues is a key element of increasing the potential effectiveness of ERAS protocols. These include provider resistance to change, lack of ARI protocol awareness or understanding and logistical problems with scheduling/resource assignment. To overcome these obstacles, several key strategies (described below) can be employed by engaging all stakeholders in the planning and implementation process; creating a set of straightforward guidelines to follow is an important first step as proven throughout this publication; demonstrating success through pilot programs or case studies. Peer support and mentorship can also assist - where experienced providers are able to help guide their colleagues in the adoption of

ERAS practices. Using technology, including mobile apps and electronic health records (EHRs), can also expedite implementation by offering reminders to improve compliance over time. More work is needed to continue confirming and refining ERAS protocols going forward. This includes performing larger multicentre studies, to allow for generalizing the findings also exploring other surgical specialties that would benefit from ERAS practice. This will help provide evidence to compare ERAS protocols against other perioperative care paradigms in a comparative effectiveness research framework designed to determine the most efficacious strategies for enhancing surgical outcomes. Research should also examine the durability of benefits on patient-centered outcomes, such as quality of life and functional status in conjunction with measures of health care utilization. In addition, understanding the cost-effectiveness of ERAS protocols can likely serve as a valuable tool to further justify broad-based efforts aimed at adopting such programs, due to their mate economic implications for healthcare systems.

## Conclusion

To conclude, this study presents compelling evidence that ERAS protocols are clinically effective in general surgery and can significantly enhance patient outcomes while reducing healthcare costs. The findings suggest that a multi-agency approach and regular training are important for effective implementation. The study has several strengths including its prospective design and collection of data on many potential confounders, but also limitations

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