

Systematic Review

Enhanced recovery after surgery protocol: impact on postoperative recovery and complications

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ABSTRACT

The enhanced recovery after surgery (ERAS) protocol consists of a set of multimodal strategies aimed at optimizing perioperative care, with the goal of reducing the surgical stress response and improving postoperative outcomes. In this systematic review, it was observed that the implementation of ERAS reduces length of hospital stay, decreases postoperative complications, and reduces opioid use. However, the benefits were less evident in patients with greater clinical severity or those undergoing more invasive surgeries. Thus, the ERAS protocol appears to be effective in optimizing surgical recovery, especially when there is high adherence and individualized care.

Keywords: ERAS protocol, Postoperative recovery, Postoperative complications, Perioperative care, Length of hospital stay

INTRODUCTION

The enhanced recovery after surgery (ERAS) protocol represents a paradigm shift in perioperative care, promoting a multimodal and interdisciplinary approach aimed at reducing the surgical stress response and optimizing patient recovery.¹⁻³ By integrating measures such as multimodal analgesia, nutritional optimization, early mobilization, and reduced opioid use, ERAS seeks to minimize postoperative complications, improve patient comfort, and shorten hospital length of stay.^{1,4-6}

Several studies demonstrate that strict adherence to the protocol is associated with significantly improved clinical outcomes, including a lower incidence of infections, thromboembolic events, cardiac and respiratory complications, as well as reduced opioid analgesic use and decreased postoperative fatigue.⁵⁻⁹ The ERAS protocol has been applied across different surgical specialties, with

consistent evidence showing that practices such as preoperative carbohydrate loading, optimized fluid management, and early mobilization contribute to faster functional recovery and greater patient satisfaction.^{4,8,10-13}

Despite its benefits, successful implementation of ERAS may be limited by individual patient-related factors, including respiratory comorbidities, hypoalbuminemia, advanced age, and preexisting complications, which increase the risk of protocol failure and serious adverse events.^{7,14-16} In addition, institutional barriers such as insufficient team training, lack of resources, and low adherence to protocol elements may compromise the expected outcomes.^{2,17-19} In this context, the present study aims to comprehensively analyze the impact of ERAS implementation on postoperative recovery, evaluating its effectiveness in reducing clinical complications, optimizing hospital length of stay, and improving the patient experience.

METHODS

This study is a systematic review based on the analysis of the PubMed database, using a temporal scope from 2021 to 2025. The search terms “ERAS protocol”, “recovery”, and “complications” were used, combined with the Boolean operator “AND”. A total of 1277 articles were identified, of which 20 studies were selected for the review. Original articles published in Portuguese, English, and Spanish, available on PubMed and within the defined

time frame, were included. Additionally, studies were eligible if they addressed the ERAS protocol and reported outcomes such as hospital length of stay, complications, postoperative recovery, reasons for non-adherence to the protocol, or reduction in the use of narcotics for pain control. Conference abstracts, paid-access studies, and studies that did not directly address the topic were excluded (Figure 1).

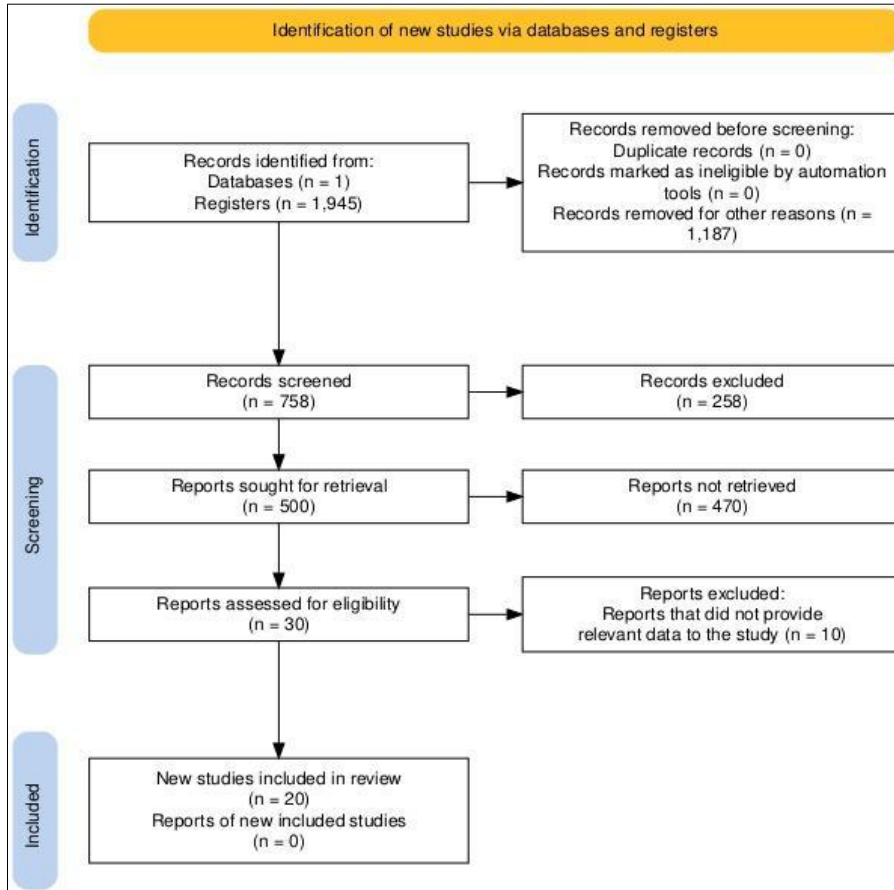


Figure 1: Flow diagrams generated using a Shiny App. Haddaway, NR, Page, MJ, Pritchard, CC, & McGuinness, LA (2022).

RESULTS

The analysis of the selected studies demonstrated that patients managed under the ERAS protocol experienced a significant reduction in hospital length of stay, with mean durations ranging from 2.5 to 4.7 days among patients following the protocol, compared with 5.8 to 8.2 days in control groups.^{4,5,7} Patients with high adherence to ERAS showed a 25% to 40% reduction in the occurrence of relevant postoperative complications, including infections, thromboembolic events, and respiratory complications.⁶⁻⁸

Overall adherence to the protocol ranged from 65% to 90% across the different studies, with higher adherence rates being associated with a lower need for intensive care support and shorter hospital stays (Figure 2).^{8,10}

Early mobilization was initiated in 80% to 95% of patients, and the reintroduction of oral diet occurred, on average, 12 to 24 hours after surgery, contributing to a faster recovery of physiological functions.^{4,10,11} The use of opioid analgesics showed an average reduction of 30% to 50% without compromising pain control, and there was also a significant decrease in gastrointestinal and infectious adverse effects.^{5,6,18}

However, the benefits of the protocol were less pronounced in patients with greater clinical severity and in more invasive surgical procedures, with complication reduction of only 10% to 15% and hospital stays still exceeding 5 days, highlighting the influence of patient profile and type of surgery on the effectiveness of ERAS (Table 1).^{7,14,15}

Table 1: Comparative table of the percentage reduction in postoperative complications in patients undergoing the ERAS protocol according to the level of protocol adherence and clinical severity.

Complications	Reduction in patients with high ERAS adherence	Reduction in patients with greater clinical severity
Postoperative infections	30-40% reduction	10% reduction
Thromboembolic events	25-35% reduction	10% reduction
Respiratory complications	25-40% reduction	15% reduction

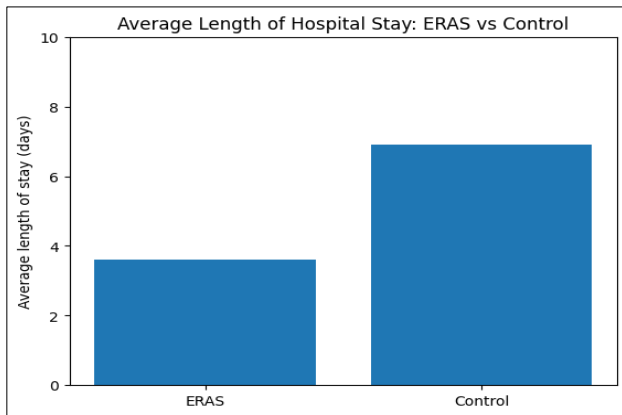


Figure 2: Comparison of the mean length of hospital stay (days) between patients undergoing the ERAS protocol and the control group.

DISCUSSION

The results of this systematic review confirm that the implementation of the ERAS protocol provides consistent clinical benefits, particularly in reducing hospital length of stay and decreasing postoperative complications.^{1,7} The average reduction of 2 to 3 days in hospital stay observed in the analyzed studies is consistent with findings from previous reviews, which demonstrated that full adherence to ERAS can reduce hospital length of stay by up to 30% to 40% in abdominal and urological surgeries.^{4,5}

Furthermore, the significant reduction in the use of opioid analgesics, without compromising pain control, is consistent with previous studies that identify multimodal analgesia as one of the key elements for early functional recovery and the reduction of medication-related adverse effects.^{5,6,8} The implementation of measures such as early mobilization and early reintroduction of oral diet also demonstrated a positive impact on the recovery of physiological functions, reinforcing previous evidence associating these practices with improved mobility, reduced fatigue, and fewer gastrointestinal complications.^{10,11}

Subgroup analysis indicated that patients with greater clinical severity or those undergoing more invasive surgical procedures experience smaller benefits, suggesting that individual patient factors and procedural complexity directly influence the effectiveness of the protocol.^{7,14,15,20} This finding is consistent with previous studies that emphasize the importance of preoperative

assessment and individualized adaptation of ERAS in order to maximize clinical outcomes.^{7,16}

Future studies should prioritize the standardization of protocol adherence metrics, long-term evaluation of clinical outcomes, and analysis of hospital costs in order to strengthen the evidence regarding the effectiveness of ERAS in different surgical contexts. In summary, the analyzed data reinforce that ERAS is an effective strategy to optimize postoperative recovery, reduce complications, and improve patient experience, particularly when there is high adherence to protocol elements and individualized adaptation to the patient's clinical conditions.^{4,7,8}

CONCLUSION

The analysis of the studies included in this systematic review demonstrates that the implementation of the ERAS protocol is associated with improved postoperative outcomes, including a reduction in hospital length of stay, a lower incidence of clinical complications, particularly infectious and thromboembolic events, and decreased use of opioid analgesics, without compromising pain control. Interventions such as early mobilization, early reintroduction of oral diet, and multimodal analgesia proved to be essential for accelerating patients' functional recovery. However, factors such as greater clinical severity, the presence of comorbidities, and increased surgical complexity may influence these benefits, highlighting the importance of preoperative assessment, individualized care, and adequate adherence to the protocol components. Therefore, in addition to consolidating recent scientific evidence, this study also contributes to clinical practice by providing support for decision-making in perioperative care, assisting healthcare professionals in implementing evidence-based strategies that promote surgical recovery and reduce postoperative complications.

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