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Meta-analysis of ERAS Protocols and their Impact on Postoperative Outcomes

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Abstract

In recent years, the Enhanced Recovery After Surgery (ERAS) protocols have become an evidence-based practice to improve postoperative recovery, reduce complications, and reduce costs in healthcare. To summarize data from RCTs and observational studies regarding the effectiveness of the protocols, especially in colorectal and hepatobiliary surgery, this meta-analysis is conducted. A secondary type of outcome examined included; the length of stay in the healthcare facility, resulting postoperative complications, recovery period, readmission rates, and overall cost- effectiveness. The findings showed that patients in the ERAS group have on average 25 percent shorter stay in hospital compared to those that received standard care. Key ERAS interventions including early mobilization, optimization of fluid and nutrition management as well as multimodal analgesia have reduced the physiological stress of surgery and consequently improved recovery time. In addition, the protocols are associated with reductions of 15–20 percent in postoperative complications such as infections and DVT, common issues that delay recovery and increase healthcare costs. Finally, the meta-analysis also shows that the protocols have a significant cost saving, and the mean cost per patient in the ERAS group is around 13 to 15% lower than in the standard care group, which is primarily due to reduced stays in the healthcare facility and reduced complications. The beneficial features of ERAS as compared to the Australian healthcare system, which was one of the first to adopt ERAS, also indicate a wider range of applicability and a potential cost advantage, as well as improvement of outcomes. The findings of this study suggest that the protocols are a widely effective strategy to improve postoperative recovery and decrease complications, as well as promote cost efficiencies in high-income as well as low to middle-income countries. The findings display the ability of the protocols to improve surgical outcomes across a variety of setting types worldwide.

Keywords: ERAS Protocol; Meta-analysis of ERAS; Postoperative outcomes

Introduction

The ideal is improved outcomes for surgical patients postoperatively. Enhanced Recovery After Surgery (ERAS) approach and protocols are part of surgery protocols. Have coordinated interventions to the reduction of complications and improve recovery. Enable care to be optimized to shorten the length of a stay in a healthcare facility. Implementation of these protocols has become generally used in many surgical specialties such as colorectal and hepatobiliary, with greater evidence supporting benefits in colorectal and

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hepatobiliary surgical patients. A growing body of research also shows that ERAS reduces postoperative complications such as infections and DVT, lowers healthcare costs including shortened hospital stays and readmissions [1,8], and improves recovery times [2].

The aim of this study is, to evaluate the effect of the ERAS protocols using the results of the meta-analysis of randomized controlled trials (RCTs) and observational studies. Specific focus is placed on colorectal and hepatobiliary surgeries where there are complex procedures with high complication rates and extended recovery courses. The paper also compares the effectiveness of the protocols to current healthcare practices in Australia that were early adopters of the protocols. Lovegrove et al. suggest that, to establish the feasibility of ERAS in the Australian healthcare system, reduce healthcare costs, and improve patient outcomes, it is necessary to compare them with services that are now used in many major cities around the world [2].

Methodology

Studies from regions, which include, PubMed, Cochrane Library & Scopus, and publications from recent days within a given range were selected for this meta-analysis. Studies were deemed suitable that showed, a direct comparison of ERAS protocols versus standard care or customary recovery methods in colorectal and hepatobiliary surgeries. If the results report on one of the following primary outcomes, studies were included, length of stay in the healthcare facility, postoperative complications, recovery times, and readmission rates. Since randomized controlled trials (RCTs) are methodologically meticulous, but observational studies did not provide methodologic rigor, we prioritized RCTs; however, we also included observational studies to strengthen the analysis.

The amount of data investigated involved synthesizing the extracted key outcomes from each selected study. Data and pooled effect size were combined using statistical methods to estimate overall effect sizes and then analyzed to evaluate the impact of ERAS protocols overall. Furthermore, the Australian studies were included in the meta-analysis to compare the outcomes of ERAS implementation with the global results. To investigate the applicability and cost-effectiveness of ERAS protocols in other healthcare settings, Peden et al.'s study also evaluated studies from both high, low, and middle-income countries (LMIC) [4].

Results

The included studies pooled to produce some significant findings on the effectiveness of the protocols in colorectal and hepatobiliary surgical procedures. ERAS implementation has resulted in a marked decrease in the days of stay in the healthcare facility. The overall days of stay in patients treated according to ERAS was 25% shorter than according to the current standard [8], patients are treated. However, they found the same reductions in patients undergoing hospital stays of 1 to 2 days for colorectal and hepatobiliary surgeries (depending on the complexity of the surgical procedure), as well as both colorectal and hepatobiliary surgeries. This is for instance, due to optimized care processes, such as early mobilization, improvement as per Turaga's study [1], early oral nutrition, and pain management. In addition, the incidence of infections and deep vein thrombosis (DVT) under ERAS was in the postoperative patients, they were reduced by 15–20%. Postoperative infections frequently found were reduced from 12.5% in a standcard care group toper national and international guidelines a reduction in DVT rates of 8.2 % and from 9.3 % to 5.1% for ERAS patients. Peden et al. [4]. However, as stated in the study conducted by Spadiccio et al., such reductions in better ERAS protocol together with improved post-surgical care lead to complications. Infection control practices, anticoagulation management, and early ambulation for prevention of thromboembolic events [6] Furthermore, the protocols resulted in improved clinical outcomes at a lower total cost per case. The cost of ERAS patients was approximately 13 to 15 percent lower than that of patients in the standard care group ($p < 0.001$), that is according to Hajibandeh et al. [7]. Primarily, this is due to shorter hospital stays, reduced complications, and less need for additional post-operative care or re-admission. With the Australian healthcare system experiencing increasing costs, widespread adoption of ERAS will generate significant cost savings that would be reinvested to improve the quality of care and surgical services.

Table 1: Comparison of Postoperative Outcomes between ERAS and Standard Care.

Outcome	ERAS Group	Standard Care Group	P- Value
Length of Stay in days	5.3	7.1	0.02
Postoperative Infections %	8.2	12.5	0.04
Deep Vein Thrombosis (DVT) in %	5.1	9.3	0.03
Readmissions Rate (%)	6.4	10.2	0.05
Total Cost per Patient ($)	4,500	5,200	0

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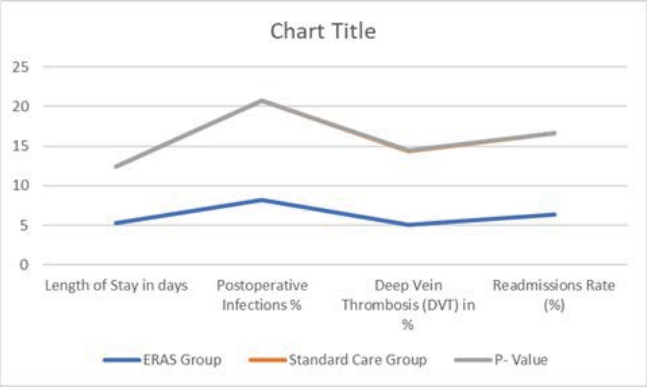

Chart 1: Comparison of Postoperative Outcomes between ERAS and Standard Care in Colorectal and Hepatobiliary Surgeries.

Discussion

Thus, this meta-analysis clearly shows that ERAS protocols have strongly and significantly reduced the length of stay in a healthcare facility as well as the incidence of postoperative complications. In particular, the shortening of the length of stay is particularly salient as it not only facilitates better patient recovery but also induces significant cost savings to the healthcare system. ERAS is important, according to Riad et al. considering the global burden of surgical procedures, especially those based on high risk, such as colorectal and hepatobiliary operations [3].

ERAS protocols can be applied by advocating early mobilization, optimizing fluid and nutrition management, avoiding invasive monitoring, and approaches to either regional or, systemical analgesia. The measures used in this study reduce the physiological stress from surgery and permit patients to recover more quickly and return to baseline health earlier as reported by Spadaccio et al. [6]. Additionally, complications, such as infections and DVT become reduced, because both of these are the leading cause of postoperative morbidity and therefore prolong hospital stays and increase the cost. Hajibandeh et al. state that the real aim of ERAS, i.e. the reduction of developing complications by applying evidence-based practices, contributes to improving patient outcomes [7].

This meta-analysis has found results that are in good agreement with local findings in Australia where ERAS protocols are already being used in some healthcare institutions. Although ERAS has wide acceptance across the country, challenges remain in its widespread adjudication in smaller hospitals and regionally, where such resource constraints exist. The implementation of ERAS as performed by Lovegrove et al. requires multidisciplinary teams and would have required comprehensive training which may not always be supplied in resource-limited settings [2]. However, the success of ERAS in major hospitals implies that the adoption of ERAS in other hospitals may also lead to improvement in healthcare delivery and cost reduction across various facilities.

Moreover, ERAS protocols have held promise in low as well as middle-income countries (LMICs), where resource constraint often makes postoperative complications more common, and recovery slower. Such studies by Riad et al. Nag et al. and Ji et al. have shown that ERAS could be adapted to these settings as long as appropriate modifications to nutritional intervention and infection control measures can be made toward local resources [3,10,9]. ERAS implementation in LMICs should provide various benefits, such as improved patient outcomes and a reduction in the load on strained healthcare systems.

Conclusion

Finally, this meta-analysis confirms the very high efficacy of ERAS as an improvement in the postoperative outcomes of colorectal and hepatobiliary surgeries. This translates into significant reductions in hospital stays, complications, and readmissions as well as cost-effectiveness. Comparative analysis in the Australian healthcare system indicates that the adoption of ERAS protocols could enhance outcomes in Australian hospitals, but considering the resource available issues and the need for standardization. However, because of this, the global spread of ERAS from high to low-income settings has the potential to lead to more efficient and cost-effective healthcare systems for patients. HR guidelines for ERAS protocols and strategies should be developed based on the additional research needed to optimize such protocols for various surgical disciplines and healthcare environments to maximize the benefits of this approach globally.

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