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## Revolutionizing Surgical Care: Exploring the Key Components of ERAS for Enhanced Recovery



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### Abstract

**Background:** Surgical care has evolved significantly over the years, with the introduction of Enhanced Recovery After Surgery (ERAS) programs emerging as a transformative approach. This literature review delves into the essential elements of ERAS, aiming to provide a comprehensive understanding of its impact on perioperative care and patient outcomes.

**Main Body:** The preoperative phase of ERAS involves meticulous patient preparation, encompassing strategies such as preoperative counseling, carbohydrate loading, and minimizing bowel preparation. These components collectively contribute to reducing preoperative anxiety, enhancing nutritional status, and mitigating the adverse effects of fasting, ultimately facilitating a smoother transition to surgery.

Intraoperative considerations within ERAS focus on techniques that minimize surgical stress, optimize fluid management, and implement pain control protocols. These critical interventions help to reduce surgical complications, accelerate postoperative recovery, and lessen the duration of hospital stays.

The postoperative phase is a cornerstone of ERAS, emphasizing early mobilization, optimized nutrition, and multimodal pain management. By incorporating these elements, ERAS programs aim to expedite recovery, decrease the risk of complications, and enhance patient satisfaction.

However, despite the evident benefits, implementing ERAS programs in clinical practice is not without challenges. This review discusses the barriers to ERAS adoption, including resistance to change, resource allocation, and the need for multidisciplinary collaboration.

**Conclusion:** Thence, ERAS represents a revolution in surgical care, offering a holistic approach to enhance patient outcomes, reduce complications, and shorten hospital stays. By exploring the key components of ERAS, this literature review provides valuable insights into the potential for widespread adoption and the imperative need to overcome implementation barriers. Ultimately, ERAS holds the promise of revolutionizing the future of surgical care, redefining standards, and improving the overall quality of patient experiences.

**Keywords:** Enhanced Recovery After Surgery, Preoperative Optimization, Intraoperative Strategies, Postoperative Recovery, Implementation Barriers.

## Revolución en la atención quirúrgica: exploración de los componentes esenciales de los programas de recuperación mejorada después de cirugía

### Resumen

**Introducción.** La atención quirúrgica ha evolucionado significativamente a lo largo de los años, con la introducción de los programas de recuperación mejorada después de cirugía. Estos programas emergen como un enfoque transformador. Esta revisión de la literatura profundiza en sus elementos esenciales, con el objetivo de proporcionar una comprensión integral de su impacto en la atención perioperatoria y en los resultados del paciente.

**Desarrollo.** La fase preoperatoria de la recuperación mejorada implica una preparación meticulosa del paciente; incluye estrategias tales como asesoramiento preoperatorio, carga de carbohidratos y minimización de la preparación intestinal. Estos componentes en conjunto contribuyen a reducir la ansiedad preoperatoria, mejorar el estado nutricional y mitigar los efectos adversos del ayuno, lo que en última instancia facilita una mejor transición a la cirugía. Las consideraciones intraoperatorias se centran en técnicas que minimizan el estrés quirúrgico, optimizan el manejo de líquidos e implementan protocolos de alivio del dolor. Estas intervenciones críticas reducen las complicaciones quirúrgicas.

Aceleran la recuperación posoperatoria y disminuyen la duración de las estancias hospitalarias. La fase posoperatoria es una piedra angular con énfasis en la movilización temprana, la nutrición optimizada y el tratamiento multimodal del dolor. Al incorporar estos elementos, los programas apuntan a acelerar la recuperación, disminuir el riesgo de complicaciones y mejorar la satisfacción del paciente. Sin embargo, a pesar de los beneficios evidentes, la implementación de estos programas en la práctica clínica no está exenta de desafíos. Esta revisión analiza las barreras para su adopción, incluidas la resistencia al cambio, la asignación de recursos y la necesidad de equipos multidisciplinarios.

**Conclusión.** La recuperación mejorada después de cirugía representa una revolución en la atención quirúrgica; ofrece un enfoque holístico para la salud del paciente, mejora los resultados, reduce las complicaciones y acorta las estancias hospitalarias. Al explorar sus componentes clave, esta revisión de la literatura proporciona información valiosa sobre el potencial de una adopción generalizada y la necesidad imperativa de superar las barreras de implementación. En última instancia, estos programas de recuperación mejorada después de cirugía buscan revolucionar el futuro de la atención quirúrgica, al redefinir estándares y mejorar la calidad general de las experiencias de los pacientes.

**Palabras clave:** recuperación mejorada después de la cirugía, optimización preoperatoria, estrategias intraoperatorias, recuperación posoperatoria, barreras de implementación.

## Revolução nos cuidados cirúrgicos: explorando os componentes essenciais dos programas de recuperação melhorados após a cirurgia

### Resumo

**Introdução.** Os cuidados cirúrgicos evoluíram significativamente ao longo dos anos, com a introdução de programas de recuperação melhorados após a cirurgia. Esses programas surgem como uma abordagem transformadora. Esta revisão da literatura investiga seus elementos essenciais, com o objetivo de fornecer uma compreensão abrangente de seu impacto nos cuidados perioperatórios e nos resultados dos pacientes.

**Desenvolvimento.** A fase pré-operatória de recuperação aprimorada envolve preparação meticulosa do paciente; inclui estratégias como aconselhamento pré-operatório, carga de carboidratos e minimização do preparo intestinal. Estes componentes em conjunto contribuem para reduzir a ansiedade pré-operatória, melhorar o estado nutricional e atenuar os efeitos adversos do jejum, facilitando, em última análise, uma melhor transição para a cirurgia. As considerações intraoperatórias concentram-se em técnicas que minimizam o estresse cirúrgico, otimizam o manejo de fluidos e implementam protocolos de alívio da dor. Essas intervenções críticas reduzem as complicações cirúrgicas.

Eles aceleram a recuperação pós-operatória e reduzem o tempo de internação hospitalar. A fase pós-operatória é fundamental, com ênfase na mobilização precoce, nutrição otimizada e manejo multimodal da dor. Ao incorporar estes elementos, os programas visam acelerar a recuperação, diminuir o risco de complicações e melhorar a satisfação do paciente. No entanto, apesar dos benefícios óbvios, a implementação destes programas na prática clínica não está isenta de desafios. Esta revisão examina as barreiras à adoção, incluindo a resistência à mudança, a atribuição de recursos e a necessidade de equipes multidisciplinares.

**Conclusão.** A recuperação melhorada após a cirurgia representa uma revolução nos cuidados cirúrgicos; oferece uma abordagem holística à saúde do paciente, melhorando os resultados, reduzindo complicações e encurtando as

internações hospitalares. Ao explorar os seus principais componentes, esta revisão da literatura fornece informações valiosas sobre o potencial de adoção generalizada e a necessidade de superar as barreiras de implementação. Em última análise, estes programas de recuperação melhorada após a cirurgia procuram revolucionar o futuro dos cuidados cirúrgicos, redefinindo padrões e melhorar a qualidade geral das experiências dos pacientes.

**Palavras-chave:** melhor recuperação após cirurgia, otimização pré-operatória, estratégias intraoperatórias, recuperação pós-operatória, barreiras de implementação.

## Introduction

Surgical care, over the years, has witnessed a profound transformation from traditional approaches characterized by extended hospital stays, high postoperative complication rates, and protracted patient recovery periods [1]. The emergence of ERAS programs has been a pivotal turning point in this evolution, heralding a new era of patient-centric and evidence-based perioperative care [2]. This literature review aims to provide an extensive exploration of ERAS, elucidating its core components and delving into its far-reaching impact on surgical care.

Historically, the conventional surgical care model involved practices such as prolonged fasting, bowel preparation, and restricted postoperative mobility [1]. However, as medical knowledge advanced and surgical techniques improved, the need for a more streamlined and patient-focused approach became evident. ERAS, a concept first introduced by Professors Henrik Kehlet and Wilmore, emerged as a response to these imperatives [2]. ERAS is a multimodal, multidisciplinary approach that integrates evidence-based principles throughout the perioperative journey, encompassing the preoperative, intraoperative, and postoperative phases.

The preoperative phase of ERAS is characterized by a series of interventions designed to prepare patients physically and mentally for surgery. These encompass preoperative counseling, carbohydrate loading, and minimizing bowel preparation [3]. Beyond reducing preoperative anxiety, these strategies enhance nutritional status and mitigate the adverse effects of fasting, setting the stage for a more favorable surgical experience.

Intraoperatively, ERAS introduces crucial considerations aimed at minimizing surgical stress and optimizing outcomes. These considerations encompass refined anesthesia techniques, judicious fluid management, and the implementation of tailored pain control protocols [4]. By reducing surgical complications and mitigating the physiological insult of surgery, ERAS significantly contributes to improving patient recovery.

The postoperative phase of ERAS represents its cornerstone, emphasizing early mobilization, optimized nutrition, and multimodal pain management [5]. Through these interventions, ERAS aims to expedite recovery, decrease the risk of complications, and reduce the duration of hospital stays. However, despite the evident benefits, the implementation of ERAS programs faces several barriers, including resistance to change within healthcare institutions, resource allocation challenges, and the necessity for seamless multidisciplinary collaboration [6].

In summary, this literature review embarks on a comprehensive exploration of ERAS, beginning with its historical context and evolving into an examination of its fundamental components. As we delve deeper into each facet of ERAS, we uncover a wealth of evidence and insights that underscore its capacity to revolutionize the landscape of surgical care. The subsequent sections of this review provide a detailed examination of the preoperative, intraoperative, and postoperative components of ERAS, while also delving into the complexities of implementing ERAS programs in clinical practice.

## The Preoperative Components of ERAS

The primary physician who treats the patient has to endorse the patient's decision to stop smoking and drinking alcohol four weeks before surgery, as per the ERAS guidelines [7]. Family physicians can direct patients on quitting smoking and provide quitting aids, counsel patients on quitting alcohol, assess withdrawal from alcohol if necessary, and give vitamins with thiamine replacement whenever necessary.

In order to minimise the probability of perioperative VTE (Venous Thromboembolism), preoperative guidance also recommends that patients stop using of contraceptive pills and hormone replacement therapies prior to surgery; as a result, patients might need counselling about other alternatives to birth control or therapy for symptoms of vasomotor dysfunction using other techniques (such as using Selective serotonin reuptake inhibitors (SSRIs), serotonin-norepinephrine reuptake inhibitors, gabapentin, clonidine, bupropion) [8].

Numerous studies, including randomised controlled trials (RCTs), systematic reviews, and meta-analyses, show that carbohydrate loading before surgery has numerous benefits, including improved patient-reported outcomes, increased insulin sensitivity, decreased postoperative inflammation, and shorter hospital stays [9,10,11,12]. Moreover, prospective studies and reviews have shown that nutritional supplementation 7 to 10 days before surgery can reduce the risk of postoperative complications and improve overall performance [13,14,15]. It is worth mentioning that preoperative malnutrition has been associated with more excellent rates of morbidity and death. However, there is no universally recommended gold standard for nutritional assessment in the preoperative situation [16,17,18,19,20].

The ERAS guidelines propose particular pre-surgery food recommendations consistent with modern medical procedures [7]. According to these instructions, solid food should be avoided 6 hours before surgery, and clear fluids should be stopped 2 hours before the procedure. Notably, these recommendations are consistent with recent recommendations issued by the Canadian, American and European anesthesiology societies [18, 19, 20].

According to recent studies, bowel preparation, when coupled with oral antibiotics, can minimise the occurrence of infections at the surgical site among individuals undergoing colorectal surgery [21]. However, most ERAS-compliant hospitals advise avoiding routine prep of the bowel for pelvic procedures such as gynaecology and gynaecological oncology. This is because bowel leakage and consequent infections are uncommon during gynecologic surgery [7].

Each medical center customizes the administration of pre-surgical drugs based on the preferences of the surgical team and in discussion with the anesthesia staff. Sedatives ought not to be administered routinely before surgery, according to ERAS-compliant facilities. Instead, the emphasis is frequently placed on improving antiemetic drugs to minimize postoperative nausea and vomiting [7]. Non-steroidal anti-inflammatory medications (NSAIDs) are commonly administered prior to surgery in some centres to improve pain relief. However, it is necessary to proceed with caution, especially in colorectal resections, because there is evidence that preoperative NSAID use increases the chance of anastomotic leakage [22, 23].

Several studies have shown that giving an antibiotic, often cefazolin, due to its advantageous effectiveness and low cost, one hour before making an incision can significantly reduce the risk of postoperative infections caused by skin flora [24, 25] Suppose a surgical operation lasts more than 3 hours or includes significant intraoperative blood loss (more than 1000 mL); an additional antibiotic dose should be given during the pro-

cedure [24, 26]. A rising body of research supports the necessity for greater antibiotic dosages in morbidly obese people [27]. Compared to a retrospective cohort, patients who used chlorhexidine as wash during the night prior to surgery had fewer infections at the surgical sites and spent less overall, according to a prospective analysis of gynecologic surgery patients [28].

## Important Intraoperative Considerations

The success of any ERAS protocol is dependent on the successful application of intraoperative care standards. This necessitates tight communication between the surgical and anesthesia teams, particularly in maintaining average body temperature and fluid balance during surgery.

Hypothermia is frequent during surgery because the body's standard temperature control is disrupted, exposure of the skin to the cold operating environment, and the use of cold intravenous fluids. In 2016, a systematic evaluation of 67 studies featuring diverse control and intervention groups, demonstrated substantial benefits associated with intraoperative warming techniques aimed at preventing hypothermia. These techniques were linked to lower rates of infections in the surgical area (RR 0.36, 95% CI 0.20 to 0.66), cardiac complications (RR 0.22, 95% CI 0.05 to 1.00), and surgical bleeding (mean difference -46.17 mL, 95% CI -82.74 to -9.59) [29]. These findings agree with those of previous systematic reviews [30].

Furthermore, a randomized controlled trial (RCT) that looked into the beyond effects of pre- and postoperative warming revealed a reduction in intraoperative blood loss and complications [31]. Raising the surrounding room temperature, utilizing systemic warming devices, using forced air warming blankets, and administering warmed intravenous fluids are all methods for achieving and maintaining normothermia.

Inadequate fluid administration during surgery can have detrimental effects. A 2018 randomized controlled trial comparing a conservative fluid regimen to a more liberal one discovered that hypovolemia was associated with a greater incidence of acute renal damage [32]. Obtaining the appropriate fluid balance during surgery can be challenging. For healthy patients undergoing uncomplicated elective procedures under an ERAS protocol, the effectiveness of guided fluid therapy - defined as using cardiovascular monitoring to assess a patient's fluid, pressure, and inotrope requirements during surgery - remains unknown [33]. However, this method has shown benefits for patients facing advanced cancer surgery, such as earlier return to normal bowel function and shorter postoperative hospitalization duration [34].

The use of nasogastric intubation in bowel surgery is discouraged due to a higher risk of post-surgical pneumonia (3.2% vs. 1.7%;  $p = 0.01$ ; RR 0.59), with no indication of reduced dehiscence of the wound or anastomotic leaking [35]. For monitoring purposes, surgeons commonly use peritoneal drains like the Jackson-Pratt drain, within the surgery site. However, little evidence supports this practice regarding reducing anastomotic leaks or enhancing overall surgical results [36,37].

## Postoperative Components of ERAS Optimize Recovery

Early initiation of oral feeding has been linked to a faster restoration of bowel function and a shorter hospital stay without an increased risk of complications in most surgical cases [38]. Randomized controlled trials in gynecologic oncology surgery, even those involving bowel resection, have indicated the benefits of early postoperative oral intake [38, 39]. In most of these studies, early intake is defined as consuming food within 24 hours of surgery, following a clear fluid protocol immediately after surgery, and gradually transitioning to the usual diet as tolerated [40].

A systematic review of 81 research found that patients who chewed gum after surgery had a shorter time to their first flatus and bowel movement and a shorter hospital stay [41]. As a result, adding gum chewing into ERAS protocols has grown in popularity due to its low-risk strategy that is well-accepted by both patients and healthcare professionals. However, a randomized controlled study (RCT) focusing on gum chewing following abdominal surgery conducted in 2018 contradicted prior findings, necessitating a meta-analysis of the current RCT data to provide a clearer picture of its efficacy [42].

To maintain an ideal fluid balance after surgery, it is essential to provide appropriate postoperative fluids. When patients swiftly shift to oral intake and display reduced post-surgical urine output, it is a prudent approach to discontinue intravenous fluid administration on the first day after surgery. This helps prevent fluid overload and enhances the patient's ability to mobilize effectively [43].

Mobilization and restoring normal functioning are critical components of the ERAS process and require a collaborative team effort. Early mobilization minimizes the risk of compromised pulmonary function, expedites recovery, reduces the possibility of thromboembolic consequences and ileus, and combats muscular atrophy [44, 45, 46]. Many recognized guidelines advise starting patient mobilization throughout twenty-four hours of the operation, with the majority recommending at least two hours on the actual day of the operation, followed by six hours on each consecutive day of the hospital stay [44]. Obtaining early mobilization may demand additional assistance from nursing, healthcare aids, and physiotherapy.

In the treatment of surgical patients, consideration of postoperative thromboprophylaxis is crucial. It is now typical practice in many ERAS centres to use a variety of mechanical strategies, like sequential compression devices (SCDs), and therapeutic interventions, like heparin, LMWH, and direct oral anticoagulants, providing prophylaxis during and right after surgery. Extending prophylaxis lasting 28 days has already been thoroughly researched in several systematic reviews, RCTs, and meta-analyses, notably in cancer patients. This approach should be strongly considered for people receiving gynecological oncology therapy and those with high-risk characteristics, such as prior thromboembolism, a family record of venous thromboembolism, limited mobility, an elevated body mass index, or those undergoing laparotomy [47, 48, 49, 50, 51]. The Caprini risk assessment score calculator [52] is an invaluable tool for clinicians to calculate the risk of postoperative VTE (venous thromboembolism) and determine the necessity for extended prophylaxis [53].

Opiate analgesics, frequently delivered through patient-controlled analgesia, have traditionally been the standard treatment for postoperative pain following laparotomy. Opiate analgesia has adverse effects, such as postoperative ileus, constipation, nausea, drowsiness, disorientation, and bradypnea. These adverse effects can impede patients' early feeding and mobilization. Epidural analgesia is an alternate technique, particularly for long laparotomy incisions. By reducing opiate consumption, this strategy hopes to lessen opiate dependency, improve pain control, and reduce nausea.

Nonetheless, epidural analgesia may introduce its own set of challenges, such as potentially causing hypotension due to peripheral vasodilatation, delaying the removal of urinary catheters, restricting mobilization due to overly extensive epidural blocks, and impacting postoperative dietary plans due to prolonged episodes of nausea caused by hypotension [54]. Many ERAS protocols now commonly recommend a narcotic-sparing approach in response to these concerns. This approach involves administering scheduled doses of non-steroidal anti-inflammatory drugs (NSAIDs) and acetaminophen. Audits of gynecologic ERAS protocol implementations have demonstrated that this approach reduces opioid consumption and the associated adverse effects [55, 56].

According to many small-scale studies, removing urinary catheters early can lower the incidence of UTIs and encourage early patient movement [57, 58]. Different health-care facilities have interpreted these findings differently, ranging from catheter removal during surgery to removal within 6 hours of surgery or on the first day after the treatment. Furthermore, early removal of catheters in epidural patients has been explored in small series of cases, which found no significant difference in the requirement for catheterization between early and delayed removal, as well as no long-term urinary issues [59, 60]. Furthermore, multiple urinary output thresholds have been proposed, often ranging from 20-30 mL/h of pee, compared to the standard threshold of 30-50 mL/h before considering catheter removal.

Vomiting and nausea following surgeries can impede early mobilization, feeding, and a swift return to regular functioning. It is imperative to prevent and promptly address nausea proactively. Employing a multifaceted strategy that addresses various receptors with each intervention is recommended. Reducing the use of opioids during and after surgery can also lower the chances of nausea and ileus following surgeries. Patients with a heightened risk of nausea may be candidates for scheduled preventive antiemetic therapy [61].

Numerous medical facilities have incorporated regular postoperative stool softeners into their ERAS protocols. This practice stems from an earlier study involving bisacodyl suppositories and magnesium hydroxide (Mg(OH)<sub>2</sub>). It indicated a slight reduction in hospitalization duration and the time it took for patients to have their first bowel movement [62].

## Barriers of Implementation of an ERAS Program

The growing complexity and rising costs within healthcare continue to pose challenges for both healthcare providers and administrators. One promising approach to address these challenges involves identifying modifiable perioperative processes like ERAS. This could enhance the efficiency of care delivery while simultaneously improving patient outcomes. Despite mounting evidence demonstrating the benefits of ERAS, there are still numerous obstacles hindering its complete adoption and implementation.

The primary hurdle begins with urologists with well-established systems who must change their practice patterns within their respective institutions. According to a recently taken questionnaire of urologic oncologists, 64% considered themselves ERAS adopters. However, almost fifty percent of them excluded two or more fundamental concepts, with just 20% fostering the use of all core principles [63]. The reasons behind the limited application of these core principles are diverse and include concerns about insufficient proof within the literature, skepticism regarding the effectiveness of ERAS, and a need for more institutional support [63].

Prior to implementing any ERAS protocol, it is crucial to conduct a comprehensive assessment of baseline outcome data. This baseline data will serve as a benchmark for evaluating the benefits of the employed ERAS protocol as it develops over time. Identifying any obstacles to implementation is essential, as it allows for a localized understanding of potential delays in protocol execution.

A comprehensive systematic review of ERAS implementation revealed common themes across most institutions, albeit specific facilitators and impediments may vary from site to site [64]. In general, the absence of explicit instructions and guidance hindered adherence, emphasizing the importance of standardization while allowing for some fle-



xibility to adapt the protocol to local conditions. Early involvement of stakeholders is critical, as is establishing open communication networks where all multidisciplinary team members can freely contribute their insights, take ownership of the venture, and flag any deviations from expected care pathways.

Facilitators include education and information provision to all involved parties, mainly through developing communities of practice where a multidisciplinary team with shared goals collaborates to share new knowledge and lessons learned [65]. Institutional resources such as creating order sets and increasing frontline staff are imperative to ensure compliance and the ability to execute prescribed orders, such as early mobilization. Additionally, ensuring the visibility of the protocol and providing regular updates to staff were found to be important facilitators. Furthermore, setting clear expectations for patients and outlining post-surgery expectations to their family members not only promotes adherence but also enhances satisfaction rates. Consistency in the information provided to patients can ultimately boost their confidence in self-care at home and better prepare them for discharge from the hospital.

Due to the intricate nature and the multitude of variables involved, the successful implementation of ERAS guidelines necessitates a well-thought-out execution strategy. Despite the fact that various guidelines have been published, two framework strategies have gained significant popularity: the breakthrough strategy and the knowledge-to-action (KTA) implementation strategy [66, 67]. The breakthrough strategy involves an external agent conducting site visits and establishing multidisciplinary teams with scheduled meetings to deliberate on innovations and multiple learning sessions. This group operates continuously within an act-plan-study-do framework, overseen by external agents who provide support throughout the process, typically spanning about a year [66].

Similarly, the KTA process represents a collaborative approach encompassing knowledge generation and application. In essence, it includes identifying potential issues, adapting existing knowledge to fit the local context, the assessment of barriers to knowledge utilization, and the selection of customized interventions, followed by ongoing monitoring and evaluation of outcomes [67]. Since 2010, the ERAS Society has established itself as a leader in the field and has issued numerous reviews and updates to facilitate program implementation. This includes the development of a guideline for perioperative care following radical cystectomy (RC) for bladder cancer [68]. Ideally, this guideline should serve as a foundational reference and a summary of the available evidence, allowing adjustments to align processes with local practices.

The successful implementation and continued effectiveness of ERAS protocols rely on ongoing data collection, performance evaluation, and feedback provision [69]. In terms of data collection, both the European ERAS Society along with NSQIP archives and databases offer valuable tools for monitoring and assessing compliance with these protocols. A systematic review encompassing more than 100 randomized trials has indicated that compliance rates tend to rise when institutions collect data before and after protocol implementation. Regularly Sharing information among all participants helps establish short-term goals and provides prompt feedback, enabling adjustments and subsequent evaluation of their effectiveness. This is mainly when supported by an enthusiastic ERAS team with dedicated leaders and advocates [69].

Following the initial rapid compliance increase, several authors have noted a decline in adherence in the subsequent years after implementation [70]. Interestingly, this well-documented decline in conformity is not associated with worse clinical outcomes, functional recovery, or complication rates [70]. Similarly, the impact upon the length of stay (LOS) appears minimal despite reduced protocol compliance in the 3-5 years post-implementation [66]. Given that some providers express concerns about the sustainability of ERAS,



it is essential to emphasize that these observed trends of declining compliance over time do not have a detrimental effect on short-term treatment outcomes [66].

As mentioned earlier, one of the challenges following the deployment of ERAS protocols is ensuring their continued application in daily practice. A number of planned activities and focused interventions are necessary to ensure programmatic maintenance and sustainability of an adopted ERAS protocol and its associated advantages within a quality improvement collaborative (QIC) framework. A recent combined analysis of post-implementation data from multiple hospitals in the Netherlands has highlighted potential strategies that can contribute to sustaining ERAS outcomes [71]. While there were considerable variations among the hospitals included in the analysis, the data indicated that most hospitals could maintain LOS below the national average, with only slight increases compared to figures from 3-5 years prior [71].

In general, these sustaining strategies should address both healthcare professionals and the organizational structure. Strategies aimed at impacting healthcare staff included ongoing internal audits with feedback on outcomes, periodic small-scale educational refreshers, and regular reminders. Conversely, strategies effective at sustaining benefits at the organizational level included altering multiple care processes, delegating responsibilities, and appointing multiple coordinators at various levels of care [71].

Despite the growing body of evidence supporting the success of ERAS, it remains crucial to examine the correlation between individual interventions and adherence rates as a part of quality improvement initiatives [72]. One recent study has proposed the development of an importance-performance matrix to prioritize areas for improvement [73]. High-quality, evidence-based protocols are fundamental components of ERAS, and performance is gauged by the adherence rate, which measures the number of patients receiving a specific intervention compared to those indicated for the intervention. Notably, through the synthesis of data on importance and performance, the authors were able to pinpoint potential areas for improvement and underscored that adherence indeed leads to improved outcomes [72, 73].

Another noteworthy aspect of ERAS is its adaptability to the evolving landscape of medical practice, encompassing changes in surgical techniques and the development of innovative non-opioid strategies for post-operative pain management. Consequently, compliance measures must be flexible and adaptable to accommodate the continuous evaluation of evidence and guideline updates.

## Conclusion

In conclusion, this literature review has illuminated the multifaceted landscape of Enhanced Recovery After Surgery (ERAS), showcasing its potential to revolutionize surgical care. By delving into the preoperative, intraoperative, and postoperative components of ERAS, along with an exploration of the barriers to its implementation, a comprehensive picture emerges. ERAS embodies a patient-centered approach that prioritizes optimal nutrition, psychological well-being, and meticulous intraoperative and postoperative care. Despite the formidable challenges in implementing ERAS, including resistance to change and resource limitations, its evidence-based principles offer a compelling pathway toward improved patient outcomes, reduced complications, and more efficient resource utilization. The future of surgical care beckons us to embrace ERAS wholeheartedly, driving us toward a healthcare landscape where patient recovery, swift and complete, takes center stage, ushering in a healthier, more resilient society.

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