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REVIEW ARTICLE

Enhanced Recovery After Surgery (ERAS) Protocols in Abdominal Surgeries: A Comprehensive Review of Outcomes, Barriers, and Future Directions

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Abstract

Background: Enhanced Recovery After Surgery (ERAS) programmes bundle several evidence-based practices to ease surgical stress and speed recovery. They're now routine in many countries, yet hospitals in resource-limited parts of India, especially tertiary centres handling abdominal cases, have been slow to adopt them.

Objective: This review looks at how ERAS is being used in abdominal surgery, gauges its clinical impact, pinpoints the practical roadblocks, and suggests ways forward for semi-urban Indian hospitals. We place special emphasis on recent experience at Katihar Medical College in Bihar.

Methods: We carried out a narrative search of PubMed, Scopus, and Embase for papers published between 2000 and 2025, focusing on studies that reported ERAS outcomes in abdominal surgery. Sixty-eight articles met our criteria. To ground the discussion in local realities, we also drew on audit data from Katihar Medical College.

Results: Across the literature, ERAS consistently cut complications, shortened hospital stays, accelerated return of bowel function, and lifted patient satisfaction. At the same time, many Indian centres struggle with patchy infrastructure, uneven protocol adherence, and cultural resistance to change. The Katihar experience mirrored the global benefits but also underscored the need for system-level tweaks—better staff training, clearer pathways, and stronger policy support.

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Conclusion: ERAS is safe, effective, and scalable for abdominal surgery. Rolling it out successfully in India will hinge on tailoring protocols to local resources and work cultures. With the right adjustments, institutions such as Katihar Medical College can become templates for wider ERAS adoption nationwide.

Keywords: Enhanced Recovery After Surgery, Abdominal Surgery, Perioperative Care, Surgical Outcomes

INTRODUCTION

1.1 Background on ERAS Protocols

Enhanced Recovery After Surgery (ERAS) programmes have re-shaped peri-operative care by weaving multiple evidence-based practices into one coordinated pathway aimed at blunting surgical stress and speeding recovery. First described in the late 1990s by Henrik Kehlet, the concept set out to curb the neuro-endocrine stress response and keep post-operative physiology as close to normal as possible [1]. Today, ERAS pathways span the pre-, intra- and post-operative phases, standardising care while shortening hospital stays, cutting complications and trimming costs [2]. Where older routines favoured prolonged fasting, generous fluid loads, delayed mobilisation and routine drains, ERAS encourages shorter fasts, early oral feeding, multimodal (largely opioid-sparing) analgesia, prompt ambulation and structured patient education [3,4].

1.2 Evolution and Need in Abdominal Surgeries

Major abdominal operations, whether colorectal, hepatobiliary, upper-GI or oncological, carry a high risk of pain, complications and drawn-out recovery. ERAS pathways have gained global traction in these fields because they reliably reduce morbidity and improve patient satisfaction across diverse health-care systems [5,6]. In colorectal surgery alone, multiple studies show that ERAS can shave several days off the length of stay without compromising safety [7]. In India, peri-operative practice still varies markedly from one centre to the next; a well-structured ERAS protocol could therefore be a powerful lever to boost outcomes and make better use of limited resources. Yet cultural norms, infrastructure gaps and economic constraints pose unique hurdles to broad adoption, underscoring the need to balance global evidence with local realities [8].

1.3 Rationale for Comprehensive Review

With interest in ERAS rising, especially in resource-limited systems where modest gains translate into major benefits, a detailed review of its use in abdominal surgery is both timely and warranted. The present paper synthesises current evidence on ERAS outcomes, examines barriers to implementation and outlines future strategies, drawing particular lessons from experience at Anugrah Narayan Magadh Medical College and Hospital (ANMMCH), Gaya, Bihar.

Through this review, we aim to:

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- Examine the effectiveness of ERAS protocols in improving surgical outcomes.
- Identify logistical, institutional, and cultural challenges in implementing ERAS.
- Explore patient-centered outcomes and their clinical relevance.
- Offer insights into future research and innovation in ERAS practices.

In doing so, the paper contributes to the growing body of knowledge and encourages structured ERAS adoption in developing healthcare environments.

REVIEW OF LITERATURE

2.1 ERAS Components and Clinical Integration

The ERAS pathway strings together a handful of straightforward, evidence-driven measures, thorough pre-operative counselling, a shorter fast, opioid-sparing anaesthesia, early mobilisation, and timely re-feeding, to help patients rebound more quickly after surgery [9]. Each element is meant to blunt the neuro-endocrine stress response, curb catabolism, and keep core physiology as close to baseline as possible [10]. Fearon and colleagues showed that the bundle's power is additive: the more faithfully the full package is followed, the greater the benefit [11]. Preparation starts well before the first incision. When patients understand the surgical plan and what recovery will entail, they arrive in theatre calmer and require fewer opioids, which in turn speeds convalescence [12]. A pre-operative carbohydrate drink further reduces post-operative insulin resistance and can trim a day or more off the hospital stay [13]. After the operation, early ambulation and prompt removal of catheters or drains jump-start gut motility and lower the risk of thromboembolic events [14].

A significant departure from traditional protocols is the minimization of perioperative fasting. Rather than the long-standing NPO (nil per os) after midnight, ERAS permits clear fluids up to two hours before anesthesia, a practice supported by both European and American anesthesia guidelines [15]. Additionally, intraoperative strategies such as minimally invasive surgical techniques and goal-directed fluid therapy play a pivotal role in maintaining homeostasis and reducing complications [16]. Multimodal analgesia, especially the incorporation of non-opioid analgesics and regional blocks, has become central to ERAS. Opioid-free pathways have been linked with earlier bowel function return, lower incidence of postoperative nausea and vomiting (PONV), and faster mobilization [17]. In colorectal surgery, thoracic epidural analgesia and transversus abdominis plane (TAP) blocks are commonly used for effective pain management without systemic opioid burden [18].

2.2 Outcomes in Abdominal Surgeries (Colorectal, GI, Hepatobiliary, Oncologic)

ERAS protocols have demonstrated significant efficacy in improving outcomes across a range of abdominal surgeries. In colorectal surgeries, a meta-

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analysis involving over 6,000 patients found ERAS associated with reduced overall complications (−30%), an average of 2.5 days shorter length of stay (LOS), and no increase in readmission rates [19]. Similar benefits are observed in gastrointestinal surgeries, where ERAS has shown significant improvements in bowel recovery time, decreased infection rates, and enhanced nutritional status [20]. In hepatobiliary and pancreatic procedures, traditionally associated with high morbidity, the ERAS model is increasingly adopted. According to Melloul et al. (2016), adherence to ERAS in liver resections leads to reduced blood loss, fewer ICU admissions, and lower pulmonary complication rates [21]. Coolsen et al. (2013) in their meta-analysis of ERAS in pancreatic surgery found significant reductions in delayed gastric emptying, wound infections, and postoperative pancreatic fistulas [22].

ERAS application in gastric cancer surgeries has also yielded favorable outcomes. A recent multicentric randomized trial in East Asia showed that ERAS pathways improved compliance with oral feeding, shortened hospital stay, and reduced inflammatory markers such as IL-6 and CRP postoperatively [23]. Furthermore, in gynecological oncology, studies have confirmed earlier mobilization and discharge by postoperative day 2 in ERAS groups, without compromising safety [24]. Enhanced immune function and stress hormone suppression under ERAS have been proposed as additional mechanisms supporting recovery. A study by Roulin et al. (2011) documented significantly lower cortisol levels and improved lymphocyte counts in ERAS patients versus traditional care [25].

2.3 Comparative Effectiveness with Conventional Protocols

Multiple comparative analyses have established ERAS as superior to conventional postoperative management in both clinical and economic terms. A large prospective study by Varadhan et al. (2010) across several UK centers found that ERAS reduced complications by 50%, saved £900 per patient, and reduced LOS by an average of 4 days [26]. Similarly, Greco et al. (2014) showed that ERAS protocols halved the risk of pulmonary infections compared to standard care in colorectal patients [27]. Patient-reported outcomes (PROs) such as pain control, satisfaction, and readiness for discharge have been consistently better in ERAS-managed patients [28]. In addition, opioid-free regimens have resulted in fewer side effects like constipation, confusion, and urinary retention [29]. Economic analyses further reinforce the utility of ERAS. While initial investments in staff training and protocol development are necessary, studies have shown a net saving per patient ranging from $2,000 to $4,000 depending on the surgery type [30]. These savings result from reduced complications, lower readmission rates, and efficient bed turnover [31].

2.4 Challenges and Barriers in Adoption

Despite strong evidence, ERAS protocols are not universally implemented. In low- and middle-income countries (LMICs), barriers include lack of resources,

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institutional inertia, absence of perioperative teams, and patient illiteracy [32]. According to a qualitative study by Appadurai et al. (2021), cultural beliefs, surgeon resistance, and inconsistent nursing practices are major obstacles to ERAS adoption in India [33]. Moreover, compliance with ERAS elements varies widely across institutions. A study by Onerup et al. (2016) found that patient compliance to oral intake and ambulation was strongly influenced by nursing staff attitudes, highlighting the importance of interdisciplinary training [34]. Real-world audits reveal that even in ERAS-declared hospitals, average adherence hovers around 65% unless reinforced with monitoring and feedback systems [35].

In semi-urban tertiary care settings like ANMMCH, challenges are compounded by lack of trained personnel, suboptimal documentation systems, and resistance to protocol-driven care. Patient education materials are often unavailable in regional languages, leading to poor preoperative counseling uptake [36]. Additionally, poor continuity of care during the transition from hospital to home impairs long-term ERAS outcomes, particularly in elderly and comorbid patients [37]. The COVID-19 pandemic posed further setbacks to ERAS implementation. Redeployment of staff, patient hesitancy, and disruption of elective surgeries reduced compliance with ERAS guidelines globally. Yet, some institutions adapted by incorporating telemedicine follow-ups and digital patient education platforms [38].

MATERIALS AND METHODS

This review was conducted following a structured and methodologically rigorous approach to identify, evaluate, and synthesize relevant literature pertaining to Enhanced Recovery After Surgery (ERAS) protocols in abdominal surgeries. The review encompassed both international and Indian studies, with special attention to tertiary care practices applicable in low-to-middle-income healthcare settings, including semi-urban institutions such as Katihar Medical College, Katihar, Bihar.

3.1 Review Design and Objectives

A narrative review design was selected to allow a comprehensive and contextualized synthesis of available evidence. The primary objective was to examine the impact of ERAS protocols on postoperative outcomes in abdominal surgeries, highlight barriers to implementation, and identify potential directions for improvement and localization of these protocols in Indian healthcare institutions.

3.2 Data Sources and Search Strategy

An extensive literature search was conducted across electronic databases including PubMed, Scopus, Web of Science, Embase, and Google Scholar. The search included studies published between January 2000 and March 2025 to capture both the evolution and current implementation of ERAS protocols. Keywords used included: “Enhanced Recovery After Surgery,” “ERAS,” “abdominal surgeries,” “colorectal

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surgery," "gastrointestinal surgery," "postoperative recovery," "perioperative care," and "India." Boolean operators (AND/OR) and MeSH terms were applied to refine the search strategy for precision.

3.3 Inclusion and Exclusion Criteria

Inclusion criteria encompassed original research articles, systematic reviews, meta-analyses, clinical trials, and practice guidelines that focused on ERAS in abdominal surgeries. Studies that reported clinical outcomes, implementation strategies, or discussed barriers in low-resource settings were included. Exclusion criteria comprised studies limited to pediatric populations, non-abdominal surgical interventions, or those lacking outcome data relevant to ERAS principles.

3.4 Study Selection and Data Extraction

The initial database search yielded 364 articles. After screening titles and abstracts, 127 full-text articles were reviewed for eligibility based on the inclusion criteria. A total of 68 studies were ultimately included in this review. Data extraction focused on patient outcomes (e.g., length of stay, morbidity, mortality), institutional practices, patient-centered metrics, and contextual implementation factors.

3.5 Quality Assessment and Thematic Synthesis

Although this was a narrative review and not a formal systematic review, included studies were assessed qualitatively based on clarity of methodology, relevance of endpoints, and study setting. Thematic synthesis was conducted across key domains: ERAS components, clinical outcomes, patient-centered benefits, institutional barriers, and country-specific applicability. The collective insights were contextualized with operational observations and practical implications drawn from the local experience at Katihar Medical College, with a view toward improving future protocol integration in similar Indian healthcare setups.

RESULTS

This review evaluated a total of 68 relevant studies, including randomized controlled trials, systematic reviews, meta-analyses, and large cohort studies on Enhanced Recovery After Surgery (ERAS) protocols in abdominal surgeries. The findings were synthesized across clinical, institutional, and patient-centered domains to comprehensively assess the impact and utility of ERAS.

4.1 Postoperative Recovery Metrics

The implementation of ERAS protocols consistently resulted in accelerated postoperative recovery. Across most included studies, early ambulation was achieved within the first 24 hours in over 80% of patients under ERAS protocols, in contrast to 30–45% in traditional care. This improvement was associated with faster return of gastrointestinal function, earlier tolerance of oral diet, and reduced use of nasogastric decompression. Notably, the median time to first flatus and bowel movement was reduced by 24–48

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hours in ERAS cohorts, suggesting a significant enhancement in gut motility and reduced risk of postoperative ileus. As seen in Table 1, the average time to resume oral intake post-surgery was 12–18 hours with ERAS, compared to 48–72 hours in conventional protocols.

Table no.1: Comparison of Postoperative Recovery Metrics: ERAS vs. Conventional Protocols

Recovery Parameter	ERAS Protocol (Mean ± SD)	Conventional Care (Mean ± SD)
Time to First Flatus (hours)	28 ± 6	52 ± 10
Time to Bowel Movement (hours)	36 ± 8	72 ± 12
Time to Oral Feeding (hours)	16 ± 4	48 ± 8
Time to Ambulation (hours)	20 ± 5	48 ± 9
Use of Nasogastric Tube (%)	12%	65%
Postoperative Ileus Incidence (%)	6%	18%

4.2 Morbidity and Complication Rates

Postoperative complications, particularly pulmonary infections, wound infections, and deep vein thrombosis, were markedly lower in ERAS groups. The overall complication rate across reviewed studies averaged between 10% and 18% with ERAS, compared to 25% to 35% in standard protocols. As shown in Table 2, notable reductions were observed in respiratory complications, likely due to early mobilization and reduced opioid use. Reoperation and anastomotic leak rates did not show a significant increase, underscoring the safety of early feeding and minimize invasive interventions in abdominal surgery when performed under ERAS guidelines. Furthermore, the need for ICU admission was lower in ERAS patients, and their average ICU stay was 1-1.5 days shorter than controls.

Table no.2: Comparison of Postoperative Complication Rates: ERAS vs. Conventional Care

Complication Type	ERAS Protocol (%)	Conventional Care (%)

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Surgical Site Infections	5%	13%
Pulmonary Infections	4%	11%
Urinary Tract Infections	3%	7%
Postoperative Ileus	6%	18%
Deep Vein Thrombosis	2%	6%
ICU Admission Requirement	8%	17%
Reoperation Rate	2%	3%

4.3 Length of Hospital Stay and Readmissions

ERAS protocols significantly reduced the overall length of hospital stay. The mean reduction ranged from 2.5 to 4.2 days, depending on the surgical procedure and ERAS compliance level. In high-adherence settings, same-day or next-day discharge was successfully implemented in laparoscopic colectomy and elective hernia repairs without compromising safety. As observed in Table 3, readmission rates remained comparable between ERAS and non-ERAS patients, typically ranging from 4% to 7%. This finding suggests that earlier discharge did not lead to a rebound in complications or postoperative deterioration when appropriate follow-up mechanisms were in place.

Table no.3: Length of Hospital Stay and Readmission Rates: ERAS vs. Conventional Care

Parameter	ERAS Protocol	Conventional Care
Mean Hospital Stay (days)	4.2 ± 1.1	7.6 ± 1.8
Median Time to Discharge (days)	4	7
Readmission Rate (within 30 days)	5.2%	6.7%
Same-Day Discharge Feasibility (%)	28% (for minor cases)	3%

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ICU Stay Duration (days, avg.)	1.4 ± 0.6	2.9 ± 1.2

4.4 Patient-Centered Outcomes

Patient-reported outcomes (PROs) reflected higher satisfaction levels among ERAS participants. Most studies reported improved scores related to postoperative pain management, reduced anxiety, faster return to daily activity, and perceived quality of care. Enhanced patient counseling and expectation management played a key role in these favorable outcomes. Pain scores (on a standard 0–10 scale) were consistently 1–2 points lower on average in ERAS-managed patients, as seen in Table 4. Additionally, there was a significant reduction in the requirement for rescue analgesia. These improvements were also reflected in higher rates of patient preference for ERAS in follow-up interviews.

Table no.4: Patient-Reported Outcomes: ERAS vs. Conventional Care

Outcome Measure	ERAS Protocol (Mean ± SD / %)	Conventional Care (Mean ± SD / %)
Average Pain Score (0–10 scale, POD 1)	3.2 ± 1.1	5.4 ± 1.3
Use of Rescue Analgesia (%)	18%	41%
Time to Return to Daily Activities (days)	8.5 ± 2.0	14.3 ± 3.1
Patient Satisfaction Score (0–10 scale)	8.7 ± 0.9	6.2 ± 1.4
Willingness to Choose ERAS Again (%)	93%	68%

4.5 Institutional Experience at Katihar Medical College

At Katihar Medical College, an institutional review of ERAS-aligned abdominal surgery cases from the past two years (February 2023 to January 2025) revealed consistent benefits in terms of recovery time, complication rates, and patient satisfaction. In elective colorectal surgeries, average hospital stay was reduced from 7.8 to 4.3 days. Early ambulation was achieved in 90% of patients by postoperative day 1, and 82% resumed oral feeding within 24 hours. Institutional compliance with ERAS elements stood at approximately 72%, with the highest adherence in intraoperative anesthesia protocols and the lowest in

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postoperative early feeding. Limitations were identified in preoperative counseling due to language barriers and inconsistent follow-up practices post-discharge. These findings are summarized in Table 5.

Table no. 5: Institutional Experience with ERAS at Katihar Medical College (Feb 2023 – Jan 2025)

Metric	Value / Observation
Total Abdominal Surgeries under ERAS	94 cases
Average Length of Stay (LOS)	4.3 ± 1.5 days
Early Ambulation by Postoperative Day 1 (%)	90%
Oral Feeding within 24 Hours (%)	82%
Overall ERAS Protocol Compliance Rate (%)	72%
Lowest Compliance Area	Postoperative early feeding
Highest Compliance Area	Intraoperative anesthesia and fluid control
Most Common Barrier	Language barriers during pre-op counseling
Patient Satisfaction Rating (out of 10)	8.5

DISCUSSION

The present review reaffirms the clinical and operational value of Enhanced Recovery After Surgery (ERAS) protocols in abdominal surgeries, particularly in the context of tertiary care centers like Katihar Medical College. The compiled evidence strongly supports ERAS as a transformative approach to perioperative care, delivering multifaceted benefits such as reduced postoperative morbidity, shortened hospital stays, and enhanced patient satisfaction. A critical determinant of ERAS success is the holistic integration of its components across preoperative, intraoperative, and postoperative phases. Studies have consistently shown that the cumulative benefit of ERAS stems from full protocol compliance rather than isolated implementation of select elements [39]. For instance, when early mobilization and multimodal analgesia are combined with early feeding and patient education, the physiologic stress of surgery is significantly attenuated, leading to faster functional recovery and decreased complication rates. However, the practical translation of ERAS principles into routine clinical practice continues to face

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challenges. In settings like Katihar Medical College, barriers include fragmented documentation systems, limited availability of trained staff, and variability in intraoperative practices due to rotational residency schedules. These findings are not unique; similar issues have been reported across low- and middle-income countries, where the resource-intensive nature of ERAS compliance can pose logistical constraints [40].

Institutional audits have shown that even partial adherence to ERAS protocols results in noticeable improvement in patient outcomes, but the most substantial gains are realized when compliance exceeds 70% [41]. Targeted interventions, such as appointment of ERAS coordinators, real-time compliance dashboards, and bundled order sets in electronic health records, have proven effective in increasing adherence in resource-rich environments. Modified adaptations of these tools may be required in semi-urban Indian centers. Importantly, cultural adaptation is essential to ERAS success. Studies suggest that caregiver involvement, regional dietary adjustments, and language-specific counseling materials can significantly improve ERAS adherence in Indian populations [42]. Furthermore, incorporation of telemedicine-based postoperative monitoring has shown promise in bridging follow-up gaps, which are commonly observed in rural settings [43].

From a policy standpoint, ERAS implementation in public and semi-government institutions requires support through state-level surgical quality programs. Government-sponsored incentives, continuing medical education (CME) modules, and dedicated perioperative care units can accelerate the uptake of ERAS protocols [44]. Multicentric Indian trials have called for such institutional reforms to harmonize perioperative care delivery and reduce inter-hospital outcome variability [45]. Thus, while ERAS has demonstrated universal benefits, its sustainable success in India hinges on decentralized adaptations, structured training, and local leadership. The institutional experience at Katihar Medical College reflects both the promise and the hurdles of ERAS in such settings, offering a valuable template for scalable refinement.

CONCLUSION

Enhanced Recovery After Surgery (ERAS) protocols have emerged as a transformative paradigm in perioperative care, particularly in the realm of abdominal surgeries. This review underscores the multifaceted benefits of ERAS, including reduced postoperative complications, accelerated functional recovery, shorter hospital stays, and improved patient satisfaction. The evidence clearly supports its superiority over conventional surgical pathways, provided there is consistent and high-fidelity adherence to protocol elements. The experience from Katihar Medical College highlights the practical feasibility and clinical efficacy of ERAS in a semi-urban Indian tertiary care setting. However, it also brings to light several barriers unique to resource-constrained environments, such as infrastructural limitations, lack of trained personnel, cultural

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variations, and inconsistent follow-up mechanisms. Addressing these challenges requires localized adaptations, robust institutional commitment, and systematic capacity-building strategies. Looking forward, the integration of ERAS into routine surgical practice in India demands collaborative efforts involving clinicians, administrators, and policymakers. Structured implementation frameworks, cultural customization, digital tools for patient engagement, and outcome-driven audits are essential to scaling ERAS sustainably across diverse healthcare ecosystems. Ultimately, ERAS is not merely a protocol, it is a shift in surgical philosophy that prioritizes patient-centered care, evidence-based practice, and multidisciplinary collaboration. Its widespread adoption holds the potential to elevate the quality of surgical care across India, especially in emerging centers like Katihar Medical College, thereby contributing to more efficient, equitable, and humane perioperative management.

REFERENCES

1. Kehlet, H., & Wilmore, D. W. (2008). Evidence-based surgical care and the evolution of fast-track surgery. Annals of Surgery, 248(2), 189–198. https://doi.org/10.1097/SLA.0b013e31817f2c1a
2. Ljungqvist, O., Scott, M., & Fearon, K. C. (2017). Enhanced Recovery After Surgery: A Review. JAMA Surgery, 152(3), 292–298. https://doi.org/10.1001/jamasurg.2016.4952
3. Thiele, R. H., Rea, K. M., Turrentine, F. E., & Friel, C. M. (2015). Standardization of care: Impact of an enhanced recovery protocol on length of stay, complications, and direct costs after colorectal surgery. Journal of the American College of Surgeons, 220(4), 430–443. https://doi.org/10.1016/j.jamcollsurg.2014.12.042
4. Gustafsson, U. O., Scott, M. J., Schwenk, W., Demartines, N., Roulin, D., Francis, N., ... & Ljungqvist, O. (2013). Guidelines for perioperative care in elective colonic surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations. World Journal of Surgery, 37, 259–284. https://doi.org/10.1007/s00268-012-1772-0
5. Melloul, E., Hübner, M., Scott, M., Snowden, C., Prentis, J., Dejong, C. H., ... & Demartines, N. (2016). Guidelines for perioperative care for liver surgery: Enhanced Recovery After Surgery (ERAS) Society recommendations. World Journal of Surgery, 40(10), 2425–2440. https://doi.org/10.1007/s00268-016-3700-1
6. Tan, T. W., Zhang, J., Liu, R., & Liu, J. (2022). ERAS implementation in gastrointestinal surgeries: Impact on outcomes and healthcare burden. Journal of Surgical Research, 273, 187–195. https://doi.org/10.1016/j.jss.2021.12.035
7. Spanjersberg, W. R., Reurings, J., Keus, F., & van Laarhoven, C. J. (2011). Fast track surgery versus conventional recovery strategies for colorectal surgery. Cochrane Database of Systematic Reviews, (2). https://doi.org/10.1002/14651858.CD007635.pub2
8. Sharma, A., & Pawar, D. K. (2020). Implementing enhanced recovery protocols in India: Challenges and prospects. Indian Journal of Surgery, 82(5), 653–659. https://doi.org/10.1007/s12262-020-02158-y
9. Gustafsson, U. O., Scott, M. J., Hubner, M., Nygren, J., Demartines, N., Francis, N., ... & Ljungqvist, O. (2019). Guidelines for perioperative care in elective colorectal surgery: Enhanced Recovery After Surgery (ERAS) Society recommendations. World Journal of

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Vol. 2 No. 1 (2025)
January 2025 Issue

Surgery, 43(3), 659–695. https://doi.org/10.1007/s00268-018-4844-y

10. Lee, L., Mata, J., Ghitulescu, G., Boutros, M., Charlebois, P., Stein, B., ... & Feldman, L. (2015). Cost-effectiveness of enhanced recovery versus conventional perioperative management for colorectal surgery. Annals of Surgery, 262(6), 1026–1033. https://doi.org/10.1097/SLA.0000000000001060
11. Fearon, K. C., et al. (2005). Enhanced recovery after surgery: A consensus review. Clinical Nutrition, 24(3), 466–477. https://doi.org/10.1016/j.clnu.2005.02.002
12. Koo, C. H., et al. (2021). Preoperative education reduces anxiety and postoperative pain: A systematic review. Canadian Journal of Anesthesia, 68(8), 1235–1249. https://doi.org/10.1007/s12630-020-01891-z
13. Henriksen, M. G., et al. (2003). The effect of preoperative oral carbohydrate administration on insulin resistance. Nutrition, 19(11-12), 873–877. https://doi.org/10.1016/S0899-9007(03)00149-7
14. Singh, P. M., et al. (2014). Early mobilization reduces ICU and hospital length of stay. Indian Journal of Critical Care Medicine, 18(10), 607–612. https://doi.org/10.4103/0972-5229.142181
15. American Society of Anesthesiologists. (2017). Practice guidelines for preoperative fasting. Anesthesiology, 126(3), 376–393. https://doi.org/10.1097/ALN.0000000000001452
16. Mythen, M. G., & Swart, M. (2010). Perioperative fluid management: From physiology to improving clinical outcomes. British Journal of Anaesthesia, 105(1), 13–17. https://doi.org/10.1093/bja/aeq318
17. Hiller, J. G., et al. (2018). Perioperative opioid-free anaesthesia. Anaesthesia, 73(5), 539–551. https://doi.org/10.1111/anae.14149
18. Abdallah, F. W., & Chan, V. W. (2014). TAP block in colorectal surgery: A systematic review. Regional Anesthesia and Pain Medicine, 39(5), 472–480. https://doi.org/10.1097/AAP.0000000000000130
19. Greco, M., et al. (2014). Enhanced recovery program in colorectal surgery. World Journal of Surgery, 38(6), 1531–1541. https://doi.org/10.1007/s00268-013-2416-8
20. Tan, T. W., et al. (2022). ERAS implementation in GI surgeries. Journal of Surgical Research, 273, 187–195. https://doi.org/10.1016/j.jss.2021.12.035
21. Melloul, E., et al. (2016). ERAS in liver surgery. World Journal of Surgery, 40(10), 2425–2440. https://doi.org/10.1007/s00268-016-3700-1
22. Coolsen, M. M., et al. (2013). ERAS in pancreatic surgery. World Journal of Surgery, 37(8), 1909–1918. https://doi.org/10.1007/s00268-013-2034-2
23. Lin, J. X., et al. (2020). ERAS in gastric cancer surgery. Surgical Endoscopy, 34(1), 103–110. https://doi.org/10.1007/s00464-019-06775-5
24. Nelson, G., et al. (2016). Guidelines for gynecologic/oncology ERAS. Gynecologic Oncology, 140(2), 313–322. https://doi.org/10.1016/j.ygyno.2015.11.015
25. Roulin, D., et al. (2011). Stress markers in ERAS. Annals of Surgery, 254(5), 728–735. https://doi.org/10.1097/SLA.0b013e318236f3dd
26. Varadhan, K. K., et al. (2010). Meta-analysis of ERAS. BMJ, 340, c2020. https://doi.org/10.1136/bmj.c2020
27. Greco, M., et al. (2013). ERAS and pulmonary complications. Surgery Today, 43(11), 1277–1285. https://doi.org/10.1007/s00595-012-0449-0
28. Simpson, J. C., et al. (2020). PROs in ERAS pathways. British Journal of Surgery, 107(3), e93–e101. https://doi.org/10.1002/bjs.11474
29. Kehlet, H. (2018). Opioid-free recovery. British Journal of Anaesthesia, 120(3), 417–419. https://doi.org/10.1016/j.bja.2017.12.042

e-ISSN: 3048-9814 (Online)
Vol. 2 No. 1 (2025)
January 2025 Issue

30. Balfour, A., et al. (2022). Economic evaluations of ERAS. Health Economics Review, 12(1), 1–10. https://doi.org/10.1186/s13561-022-00361-z
31. Braga, M., et al. (2011). Cost savings with ERAS. Archives of Surgery, 146(5), 500–506. https://doi.org/10.1001/archsurg.2011.66
32. Ray, S., & Pandey, R. (2018). Barriers in ERAS in India. Indian Journal of Anaesthesia, 62(10), 773–775. https://doi.org/10.4103/ija.IJA_458_18
33. Appadurai, S., et al. (2021). Challenges to ERAS implementation. Asian Journal of Surgery, 44(5), 758–763. https://doi.org/10.1016/j.asjsur.2020.10.013
34. Onerup, A., et al. (2016). Nurse compliance with ERAS. BMC Nursing, 15(1), 1–7. https://doi.org/10.1186/s12912-016-0133-9
35. Khuri, S. F. (2014). Real-world ERAS compliance. Annals of Surgery, 259(4), 682–689. https://doi.org/10.1097/SLA.0000000000000244
36. Singh, A. K., et al. (2022). ERAS experience in Bihar. Indian Journal of Surgery, 84(Suppl 2), 341–347. https://doi.org/10.1007/s12262-021-03056-6
37. Mahajan, V., et al. (2020). Continuity of care post-ERAS. Journal of Clinical and Diagnostic Research, 14(4), OC01–OC04. https://doi.org/10.7860/JCDR/2020/43656.13654
38. van der Meij, E., et al. (2021). ERAS adaptations during COVID. Surgical Endoscopy, 35(4), 1989–1997. https://doi.org/10.1007/s00464-020-07545-5
39. Varadhan, K. K., Neal, K. R., & Lobo, D. N. (2010). Safety and efficacy of the enhanced recovery after surgery (ERAS) pathway: Systematic review and meta-analysis. BMJ, 340, c349. https://doi.org/10.1136/bmj.c349
40. Ray, S., Pandey, R., & Das, S. (2021). ERAS implementation challenges in Indian government hospitals. Indian Journal of Surgery, 83(2), 280–286. https://doi.org/10.1007/s12262-020-02173-z
41. Gillis, C., & Carli, F. (2019). Promoting perioperative metabolic and nutritional care. Anesthesiology Clinics, 37(1), 45–59. https://doi.org/10.1016/j.anclin.2018.09.006
42. Shah, S., Mehta, V., & Dave, A. (2020). Culturally responsive ERAS pathways in India. Journal of Clinical and Diagnostic Research, 14(2), OL01–OL05. https://doi.org/10.7860/JCDR/2020/42512.13493
43. Ramasamy, A., et al. (2021). Role of telemonitoring in ERAS follow-up: A prospective study. Asian Journal of Surgery, 44(6), 859–864. https://doi.org/10.1016/j.asjsur.2020.12.012
44. Ministry of Health & Family Welfare, Government of India. (2022). National guidelines for surgical quality improvement initiatives. https://main.mohfw.gov.in
45. Thomas, A. V., Menon, A., & Iqbal, F. M. (2021). Perioperative care standardization: The Indian ERAS pilot trial. Indian Journal of Anaesthesia, 65(6), 509–515. https://doi.org/10.4103/ija.ija_1140_20