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Original Article

Comparison of ERAS protocol versus conventional Surgical protocol in gynecologic surgeries: A randomized clinical trial

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ABSTRACT

Background and Objective: Enhanced Recovery After Surgery (ERAS) protocols provide a comprehensive, evidence-based approach to perioperative care before, during, and after surgery. This study aimed to describe the development process and initial application of ERAS protocols in gynecologic surgeries compared to conventional care methods in a university referral center. This randomized, single-blind clinical trial was conducted on patients undergoing gynecologic laparotomy surgeries at Firoozgar Hospital. A total of 88 patients were randomly assigned into two equal groups: 44 patients received care under the ERAS protocol, and 44 patients received conventional care. Demographic and clinical data were collected, and postoperative outcomes—including symptoms such as bloating, nausea, vomiting, pain severity (assessed by VAS), infection, systemic inflammatory response, patient satisfaction, and quality of life—were evaluated one month after surgery. Additionally, length of hospital stay, time to mobilization (out-of-bed), and final prognosis including readmission rates were carefully recorded. Data analysis was performed using SPSS software. Patients in the ERAS group experienced fewer serious postoperative complications requiring hospitalization, reported higher satisfaction, and demonstrated improved quality of life compared to the conventional group. Although pain severity decreased over time in both groups, it was consistently lower in the ERAS group. Moreover, the length of hospital stay was significantly shorter for patients managed under the ERAS protocol compared to those receiving conventional care ($P < 0.005$). The findings indicate that implementation of ERAS protocols in gynecologic laparotomy surgeries yields positive outcomes, including reduced postoperative complications and improved patient satisfaction and quality of life compared to conventional care.

Keywords: Enhanced Recovery After Surgery (ERAS) protocols, Conventional care, Quality of life, Patient satisfaction

Introduction

Most gynecological and obstetric surgeries carry a potential risk of postoperative complications, which significantly affect patient outcomes, quality of life (QoL), and survival. Growing evidence indicates that postoperative complications influence recurrence rates and overall survival, and are associated with prolonged hospital stays [1]. Gynecological surgeries are among the most common procedures; for instance, approximately 600,000 hysterectomies are performed annually in the United States for benign conditions [2]. The American College of Obstetricians and Gynecologists recommends using less invasive techniques to reduce costs and minimize complications [3].

Traditional postoperative management has been routinely practiced for years, yet this approach is largely based on habit without strong scientific foundations [4]. Conventional postoperative care often includes prolonged fasting, mechanical bowel preparation, and allowing oral intake only after the return of bowel sounds, such as passing gas or stool [5]. Enhanced Recovery After Surgery (ERAS) is a multifaceted, evidence-based, non-profit approach aimed at standardizing postoperative care, reducing surgical stress, improving patient outcomes, and shortening hospital stays [6, 7].

ERAS guidelines have been widely implemented across various surgical fields, including orthopedics, urology, and gynecology, leading to shorter hospital stays and increased patient satisfaction [8]. Although ERAS protocols differ somewhat among specialties, the core principles remain consistent [9–11].

Currently, ERAS protocols have been adopted in obstetrics and gynecology, with notable benefits observed in gynecologic oncology surgeries. These benefits include reduced length of hospital stay, fewer complications, and lower financial burdens without increasing mortality or readmission rates [12, 13].

This success has established ERAS as the standard postoperative care for these patients. Implementation of ERAS protocols in obstetrics and gynecology, especially in gynecologic oncology, has led to significant advantages such as decreased hospital stays, reduced postoperative complications, and cost savings without elevating readmission or mortality rates. Key components of ERAS include pre-admission patient counseling, ensuring postoperative diet adherence and hydration, prevention of intraoperative hypothermia, early oral feeding, effective postoperative pain management, encouragement of early mobilization, timely catheter removal, and facilitation of early discharge [14]. Together, these elements reduce surgical stress, lower cytokine levels, promote tissue healing, and decrease complications [15-17]. ERAS recommendations during cesarean sections aim to improve outcomes for both mother and fetus in the postoperative period [18].

ERAS protocols have gained widespread acceptance and have profoundly impacted multiple surgical disciplines, including general surgery [19], urology [20], and gynecology [21]. These evidence-based protocols have been developed and promoted by the ERAS Society, a global professional charity dedicated to advancing ERAS implementation [22-24]. Extensive research supports the benefits of ERAS adoption, demonstrating reductions in postoperative complications, hospital stay duration, pain, and overall costs, alongside increased satisfaction among patients and healthcare staff. Emerging evidence also suggests that ERAS implementation may lead to long-term improvements [25, 26].

However, despite these demonstrated advantages, global adoption of ERAS practices remains inconsistent, and implementation pathways are often uneven. Notably, in Iran, the acceptance and effectiveness of ERAS protocols remain relatively unexplored, particularly concerning gynecologic surgeries such as laparoscopy and hysteroscopy. Consequently, this study aims to fill this critical knowledge gap by comparing the economic benefits, surgical complications, patient satisfaction, and other outcomes of ERAS protocols versus conventional care at Firoozgar Hospital in Tehran.

Materials and Methods

This study was designed as a single-blind, randomized controlled clinical trial. Participants were patients undergoing gynecological surgeries at hospitals affiliated with Iran University of Medical Sciences during the year 1402 (2023-2024), who received postoperative care protocols. Inclusion criteria consisted of patients scheduled for gynecological surgeries at Firoozgar Hospital under Iran University of Medical Sciences with postoperative protocols implemented. Exclusion criteria included patients who did not attend postoperative follow-up visits, had a history of severe constipation or complications, were considered high-risk for anesthesia, had severe organ dysfunction or failure, did not provide informed consent, or had kidney failure or type 2 diabetes. Sample size was calculated based on an expected hospital stay of 5 ± 1.5 days for the routine care group and an effect size of 20%, with an anticipated average stay of 4 days for the ERAS group. This yielded a total of 88 participants (44 in each group), considering a type I error of 0.05 and a type II error of 0.2. The final study population consisted of 88 patients from those referred to Firoozgar Hospital in Tehran, all of whom completed the study questionnaire.

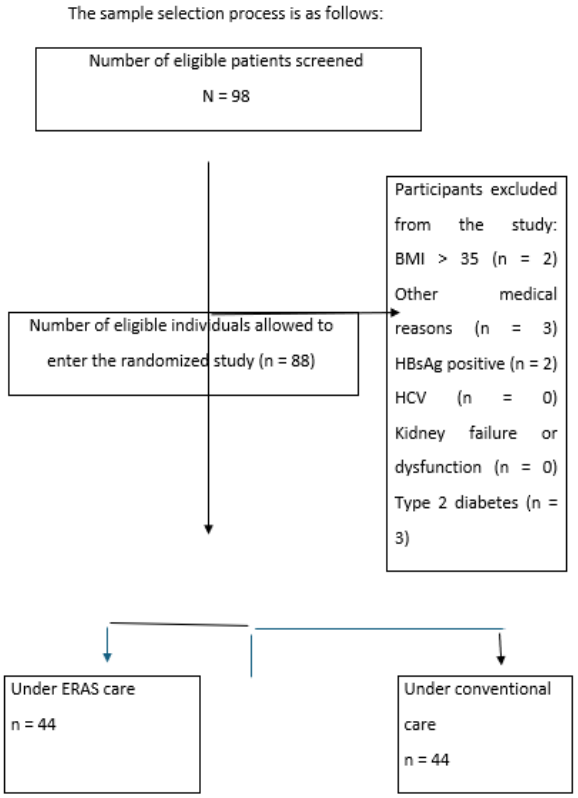

Figure 1. Flowchart of the sample selection process

Quality of life was assessed using structured interviews before hospital discharge and follow-up telephone calls after discharge, employing the WHO-QOL-BREF questionnaire [27]. Additionally, a questionnaire tailored to the context of ERAS protocols in Iran was used to evaluate surgical outcomes, postoperative complications, and patient satisfaction based on existing literature [28, 29].

Conventional protocol (control group)

Most patients in the control group were managed according to the hospital's standard routine or based on surgeon preference. Typically, patients were kept NPO (nothing by mouth) for more than 6 hours before surgery. Analgesia mainly involved long-acting opioids, usually without multi-drug regimens. Postoperative antiemetic treatment was typically limited to a single medication.

Data analysis was performed using SPSS version 26. For all statistical tests, the confidence interval was set at 95%, and a p-value of ≤ 0.05 was considered statistically significant.

Results and Discussion

The results showed that 69.3% of participants had a diploma or lower level of education, indicating relatively low educational attainment within the sample. About 27.3% held associate or bachelor's degrees, and only 3.4% had master's or doctoral degrees. Another 3.4% fell into the "master's and doctoral" category, likely representing non-standard qualifications within this population. Marital status showed that 10.2% were single and 89.8% were married. The average age in the ERAS group was slightly lower than in the conventional care group; however, the difference was not statistically significant (p = 0.546). The mean BMI was slightly higher in the ERAS group compared to the conventional group, but this difference was also not statistically significant (p = 0.331).

Table 1. Study Results

	Index	ERAS (Number and Percentage)	Routine (Number and Percentage)	P-Value
Abdominal bloating	Not reported	12 (27.3%)	7 (15.9%)	0.03
	Mild	29 (65.9%)	25 (56.8%)	
	Severe	3 (6.8%)	12 (27.3%)	
Ileus	Not reported	16 (36.4%)	20 (45.5%)	0.334
	Mild	27 (61.4%)	21 (47.7%)	
	Severe	1 (2.3%)	3 (6.8%)	
Nausea/vomiting	Not reported	21 (47.7%)	26 (59.1%)	0.404
	Mild	22 (50.0%)	16 (36.4%)	
	Severe	1 (2.3%)	2 (4.5%)	
Medication use	Celecoxib	1 (2.3%)	1 (2.3%)	
	Gabapentin	2 (4.5%)	4 (9.1%)	
	Acetaminophen	10 (22.7%)	9 (20.5%)	0.947
	Heparin	4 (9.1%)	4 (9.1%)	
	None	27 (61.4%)	26 (59.1%)	
Postoperative acetaminophen use	Yes	33 (75.0%)	6 (13.6%)	
	No	11 (25.0%)	38 (86.4%)	0.0
Postoperative analgesics	Yes	32 (72.7%)	4 (9.1%)	
	No	12 (27.3%)	40 (90.9%)	0.0
Surgical site infection	Yes	2 (4.5%)	3 (6.8%)	
	No	42 (95.5%)	41 (93.2%)	0.645
Systemic inflammation	Yes	2 (4.5%)	5 (11.4%)	0.237
	No	42 (95.5%)	39 (88.6%)	
Thromboembolism	Yes	1 (2.3%)	2 (4.5%)	
	No	43 (97.7%)	42 (95.5%)	0.557
Hospitalization within 30 days	Yes	1 (4.5%)	3 (11.1%)	
	No	21 (95.5%)	24 (88.9%)	0.404
Reoperation		0 (0.0%)	2 (4.5%)	
	Index	95	100.0%) 95.5%)42	0.153

Based on **Table 1**, in the ERAS protocol, a higher percentage of individuals reported mild abdominal bloating; however, there are no significant differences. Both protocols had a considerable number of patients with no reports of paralytic ileus, indicating success in managing surgical complications. In the Conventional protocol, a higher number of individuals reported no nausea and vomiting, although these differences are also not significant. Overall, the results indicate that there is generally no significant difference between the two protocols regarding these complications, although certain tendencies may exist that require further investigation.

At all evaluated times (4, 8, 12, and 24 hours post-surgery), pain intensity in patients under the ERAS protocol was significantly higher than in patients under the Routine protocol.

In the ERAS protocol, a high percentage of patients (75.0% for acetaminophen and 72.7% for analgesics) used these medications. In the Conventional protocol, only 13.6% of patients used acetaminophen and only 9.1% used analgesics. The significance level of less than 0.001 clearly indicates a significant difference in medication usage patterns between the two protocols, suggesting that the ERAS protocol leads to greater use of painkillers. These results can help design better post-surgical pain management programs and highlight the importance of ERAS protocols in improving clinical outcomes and reducing the need for analgesics.

Patients under the ERAS protocol used an average of 46.02 mg of opioids for pain relief, while patients under the Conventional protocol used an average of 115.34 mg. The very low significance level (<0.001) shows that this difference is statistically significant and clearly indicates that using the ERAS protocol leads to a substantial reduction in opioid requirements for pain relief compared to the Conventional protocol. These results can contribute to improving the evidence regarding the use of ERAS protocols and their impact on reducing the need for and dependency on opioids.

According to the results of **Table 1**, the significance level of 0.645 indicates no significant difference between the two protocols regarding surgical site infection. The significance level of 0.237 indicates no significant difference between the two protocols regarding systemic inflammatory syndrome. The significance level of 0.557 indicates no significant difference between the two protocols regarding venous thromboembolism. The percentages of surgical site infection, systemic inflammatory syndrome, and venous thromboembolism in both protocols are very low, and overall, serious postoperative complications in both protocols are relatively rare. In all three cases, the significance levels are above 0.05, clearly indicating no significant difference between the ERAS and Routine protocols. These results may imply that both protocols perform similarly concerning these surgical complications, demonstrating the safety and efficacy of both methods.

The significance level of 0.404 indicates no significant difference between the two protocols regarding readmission within 30 days. The significance level of 0.153 indicates no significant

difference between the two protocols regarding the rate of reoperation. (Table 1)

Table 2. One-month outcomes and type of protocol

	ERAS		%	ROUTINE	%	Pvalue
One-Month Outcome	No Specific Complication	26 people	59.1	20 people	45.5	0.002
	Common/Mild Complication	26 people	31.8	6 people	13.6	
	Serious Complication Requiring Further Evaluation	26 people	9.1	18 people	40.9	

According to the results of **Table 2**, there is no significant difference between the ERAS and Routine protocols in terms of either readmission or reoperation. In the ERAS protocol, a higher percentage of patients were reported without specific complications, whereas in the Routine protocol, a higher percentage of patients were identified with serious complications. The significance level of 0.002 clearly indicates a significant difference in one-month outcomes between the two protocols. These results can contribute to a better understanding of the impact of surgical protocols on complications and clinical outcomes and indicate the high effectiveness of the ERAS protocol in reducing complications and improving patient outcomes.

Table 3 Length of Stay (LOS) and Type of Protocol

	Type of Protocol	Mean	Std. Deviation	P-Value
Length of Stay (LOS)	ERAS	2.77	0.859	<0.001
	Routine	4.05	0.888	
Quality of Life (QOL)	ERAS	82.273	13.094	0.019
	Routine	75.227	14.546	0.019

According to the results of **Table 3**, the significance level of <0.001 indicates a statistically significant difference between the two protocols in terms of length of hospital stay. Patients under the ERAS protocol had an average hospital stay of 2.77 days, while patients under the Routine protocol had an average stay of 4.05 days. Given that the significance level (<0.001) is less than 0.05, this indicates a significant difference in the length of stay between the two protocols. These results may suggest that the ERAS protocol, due to the shorter hospitalization it provides, can be effective in reducing hospital-related complications and patient costs. Specifically, the ERAS protocol has shown better recovery outcomes in terms of hospital stay duration.

Table 4: Time to Patient Mobilization (Out of Bed)

Type of Protocol	N	Mean	StD.Deviation	Std.Error Mean	Significance Level
ERAS	44	5.1477	.91232	.13754	0.0000
Routine	44	9.5000	1.09968	.16578	

The results indicate that the time to patient mobilization (OOB: Out of Bed) in the ERAS protocol is significantly shorter than in the Routine protocol ($p < 0.001$). Furthermore, the effect size (Cohen's $d = 1.010$) indicates a strong effect between the two protocols. **(Table 4)**

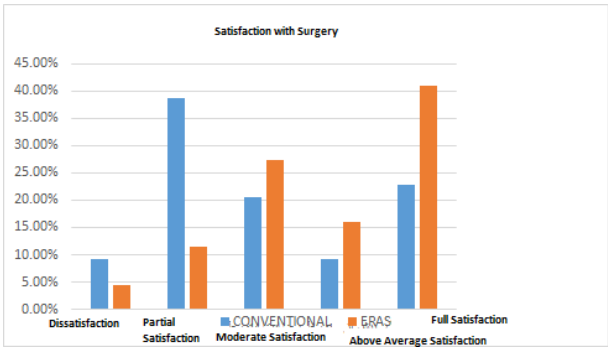

Figure 2. Comparison of Satisfaction Levels in ERAS and Conventional Methods

Given the p-values (0.030) and (0.025), it can be concluded that there is a significant relationship between the type of protocol and the level of patient satisfaction. In other words, satisfaction levels differ significantly between the ERAS and Routine protocols. **(Figure 2)**

Table 5. Quality of Life Level by Study Method

Quality of Life Level Based on Study Method	Mean	Standard Deviation (St. Deviation)	Std.Erorr Mean	P value
ERAS N=44	82.2727	13.09423	1.97403	0.019
ROUTINE N=44	75.2273	14.54562	2.19283	

Table 5 shows that the quality of life scores differ significantly between the ERAS and Routine protocol groups, with a p-value of 0.019, indicating statistical significance. Patients in the ERAS group reported a higher average score of 82.27, compared to 75.23 in the Routine group. Since the p-value is below the standard threshold of 0.05, this suggests that the ERAS protocol has a meaningful effect in enhancing patients' quality of life. These findings highlight the beneficial impact of the ERAS approach over conventional care and underscore its potential value for broader adoption in clinical settings.

In the present study, the average hospital stay for patients managed under the ERAS protocol was 2.77 days, compared to 4.05 days for those receiving Routine care. The advantage of reduced hospitalization duration observed here aligns with the findings of Sara Fernandez *et al.* (2023), who studied 206 patients—97 in the control group and 109 in the ERAS group—and reported a significant difference in length of stay (LOS). They documented a 50% reduction in LOS, decreasing from an average of 3.6 days before ERAS implementation to 1.8 days

afterward ($p < 0.0001$) [30]. Similarly, Kondo *et al*. (2014) [31] demonstrated that applying ERAS in patients with deeply infiltrating intestinal endometriosis significantly shortened hospital stays. Specifically, the LOS was reduced for laparotomy, laparoscopy, and vaginal surgeries in the ERAS group.

Among patients following the ERAS protocol, a larger proportion experienced no notable complications, while a higher proportion of patients in the Routine protocol group developed serious complications within one month postoperatively. The p-value of 0.002 indicates a statistically significant difference in one-month outcomes between the two protocols. These findings enhance our understanding of how surgical protocols influence postoperative complications and clinical results, highlighting the superior efficacy of the ERAS protocol in minimizing complications and improving patient recovery.

Relph and colleagues (2014) [32] reported no significant differences between the ERAS and Routine protocols in terms of hospital readmission and reoperation rates. Their case-control study involving patients undergoing vaginal hysterectomy similarly found no difference in readmission rates. Conversely, Bisch S.P and Nelson G.(2022) [33] observed a significantly lower incidence of postoperative complications in the ERAS group (18.3%) compared to the standard postoperative care group (33.3%) ($p = 0.02$). [33]

In this study, the WHO-QOL-BREF questionnaire was utilized to evaluate patients' quality of life, while a separate instrument assessed their satisfaction levels. Overall, the ERAS protocol significantly enhanced quality of life during the early recovery phase, particularly in domains such as bowel function (gas passage), physical mobility, social and cognitive functioning, sleep quality, and pain management. Clinically, ERAS implementation was associated with reduced postoperative discomfort and symptoms, decreased incidence of infectious complications, shorter hospital stays, higher discharge rates, and improved pain control without an increase in readmission rates. Furthermore, mental health outcomes, including sleep quality, depression, distress, and vitality, showed notable improvement. The mean satisfaction score was higher in the ERAS group (82.27) compared to the Routine care group (75.23), with a statistically significant difference ($p = 0.019$). These results align with those of Yoong, Sivashanmugarajan V, Relph S, and colleagues (2014), who assessed patient satisfaction on a 1-to-10 scale in vaginal hysterectomy patients before (n=50) and after (n=50) ERAS implementation, finding that 65% of patients in the ERAS group rated their satisfaction above 9 four weeks post-surgery [34].

Overall, 96% of patients rated the care provided from diagnosis through discharge as appropriate, with 92% describing it as "good to excellent" [35]. Fernandez. S et al(2023) reported an average satisfaction score of 8.9 out of 10 among patients treated under the ERAS protocol [30]. The high levels of satisfaction associated with ERAS in gynecological surgery can be attributed to several factors, including reduced hunger, chlorhexidine skin preparation, multimodal pain management, prevention of nausea and vomiting, antibiotic prophylaxis, fluid balance regulation, maintenance of normal body temperature, limited use of drains, early feeding, and prompt mobilization—all supported by robust evidence.

Effective pain management plays a crucial role in accelerating patient recovery, as postoperative pain is linked to longer hospital stays, higher rates of readmission, and increased healthcare costs. To mitigate postoperative pain and reduce opioid use, several multimodal analgesic strategies have been proposed. In this study, the average pain score at 24 hours post-surgery was 2.45 in the ERAS group, compared to 3.45 in the Routine care group ($p = 0.001$). Similarly, at 12 hours post-surgery, the ERAS group reported an average pain score of 4.34, while the Routine group's average was 5.39 ($p = 0.004$). These findings indicate a statistically significant difference in pain severity between the two protocols. Notably, patients under the Routine protocol experienced lower pain intensity than those in the ERAS group, which may reflect more effective pain management techniques employed within the Routine care.

Patients under the ERAS protocol used an average of 46.02 mg of opioids for pain relief, while patients under the Conventional protocol used an average of 115.34 mg. The very low significance level (< 0.001) indicates that this difference is statistically significant and clearly shows that the use of the ERAS protocol results in a substantial reduction in opioid requirements for pain management compared to the Conventional protocol. These findings can contribute to strengthening the evidence regarding the use of the ERAS protocol and its impact on reducing the need for opioids and dependence on them.

The study by Ferrari and colleagues (2020) demonstrated a reduction in pain scores at 12 and 24 hours post-surgery and found that only 37% of patients in the ERAS group requested postoperative injectable anesthesia, compared to 74% of patients in the standard care group. Notably, this randomized controlled trial supported the use of epidural or spinal anesthesia as regional blocks for patients at higher risk [36]. Meyer *et al*. (2018) investigated opioid consumption along with key patient-reported outcomes among gynecologic oncology patients and reported a 72% reduction in opioid use [37]. In our study, common postoperative complications such as surgical site infection, ileus, and nausea/vomiting were examined, and no significant differences were observed between the two protocol groups, with a significance level of 0.645. This finding is consistent with the results of the study conducted by Spanjersberg, van Sambeeck, Bremers, Rosman, and van Laarhoven (2015), who reported no significant differences in complications such as ileus, nausea, vomiting, and wound infection between the ERAS and Routine groups [38].

Fattah and colleagues (2020) reported a significant reduction in postoperative ileus between the ERAS group and the control group (9.7% vs. 20.2%; $p = 0.007$), as well as in surgical site infections (4.2% vs. 11.5%; $p = 0.01$) [38].

Considering that the ERAS protocol demonstrates superior outcomes in reducing opioid use for pain management and enhancing patients' quality of life, it is recommended to adopt ERAS as the standard protocol for elective surgeries. However,

since patients in the Routine protocol group reported experiencing less severe pain, incorporating some pain management techniques from the Routine protocol could potentially improve ERAS effectiveness. A limitation of this study is that the current infrastructure of hospitals and healthcare facilities may be inadequate for full implementation of the ERAS protocol. Additionally, cultural and social expectations surrounding medical treatment and care may pose challenges to the acceptance and understanding of ERAS.

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References

1. Bogani G, Sarpietro G, Ferrandina G, Gallotta V, Donato VD, Ditto A, et al. Enhanced recovery after surgery (ERAS) in gynecology oncology. Eur J Surg Oncol. 2021;47(5):952-9.
2. Wu JM, Wechter ME, Geller EJ, Nguyen TV, Visco AG. Hysterectomy rates in the United States, 2003. Obstet Gynecol. 2007;110:1091-5.
3. Dayaratna S, Goldberg J, Harrington C, Leiby BE, McNeil JM. Hospital costs of total vaginal hysterectomy compared with other minimally invasive hysterectomy. Am J Obstet Gynecol. 2014;210:120.e1-6.
4. Mukka A, Talwar P, Kumar MR. A randomized control study on the effectiveness of enhanced recovery after surgery (ERAS) protocol with conventional protocol in total laparoscopic hysterectomy. World J Lap Surg. 2024;17(2):69-74.
5. Iyer S, Saunders WB, Stemkowski S. Economic burden of postoperative ileus associated with colectomy in the United States. J Manag Care Pharm. 2009;15(6):485-94.
6. Altman AD, Helpman L, McGee J, Samouëlian V, Auclair MH, Brar H, et al. Enhanced recovery after surgery: implementing a new standard of surgical care. CMAJ. 2019;191(17):E469-75. doi:10.1503/cmaj.180635
7. Adamina M, Kehlet H, Tomlinson GA, Senagore AJ, Delaney CP. Enhanced recovery pathways optimize health outcomes and resource utilization: a meta-analysis of randomized controlled trials in colorectal surgery. Surgery. 2011;149(6):830-40.
8. Nicholson A, Lowe MC, Parker J, Lewis SR, Alderson P, Smith AF. Systematic review and meta-analysis of enhanced recovery programmes in surgical patients. Br J Surg. 2014;101(3):172-88. doi:10.1002/bjs.9394
9. Arsalani-Zadeh R, ElFadl D, Yassin N, MacFie J. Evidence-based review of enhancing postoperative recovery after breast surgery. Br J Surg. 2011;98(2):181-96. doi:10.1002/bjs.7331
10. Ibrahim MS, Khan MA, Nizam I, Haddad FS. Peri-operative interventions producing better functional outcomes and enhanced recovery following total hip and knee arthroplasty: an evidence-based review. BMC Med. 2013;11:37. doi:10.1186/1741-7015-11-37
11. Nelson G, Fotopoulou C, Taylor J, Glaser G, Bakkum-Gamez J, Meyer LA, et al. Enhanced recovery after surgery (ERAS®) society guidelines for gynecologic oncology: addressing implementation challenges - 2023 update. Gynecol Oncol. 2023;173:58-67. doi:10.1016/j.ygyno.2023.04.009
12. Bisch SP, Jago CA, Kalogera E, Ganshorn H, Meyer LA, Ramirez PT, et al. Outcomes of enhanced recovery after surgery (ERAS) in gynecologic oncology - a systematic review and meta-analysis. Gynecol Oncol. 2021;161(1):46-55. doi:10.1016/j.ygyno.2020.12.035
13. Grocott MP, Martin DS, Mythen MG. Enhanced recovery pathways as a way to reduce surgical morbidity. Curr Opin Crit Care. 2012;18(4):385-92.
14. Kehlet H. Fast-track colorectal surgery. Lancet. 2008;371(9615):791-3. doi:10.1016/S0140-6736(08)60357-8
15. Slim K, Kehlet H. Commentary: Fast-track surgery: the need for improved study design. Colorectal Dis. 2012;14(8):1013-4. doi:10.1111/j.1463-1318.2012.03114.x
16. Caughey AB, Wood SL, Macones GA, Wrench IJ, Huang J, Norman M, et al. Guidelines for intraoperative care in cesarean delivery: enhanced recovery after surgery society recommendations (part 2). Am J Obstet Gynecol. 2018;219(6):533-44. doi:10.1016/j.ajog.2018.08.006
17. Macones GA, Caughey AB, Wood SL, Wrench IJ, Huang J, Norman M, et al. Guidelines for postoperative care in cesarean delivery: enhanced recovery after surgery (ERAS) society recommendations (part 3). Am J Obstet Gynecol. 2019;221(3):247.e1-9. doi:10.1016/j.ajog.2019.04.012
18. Neu J, Rushing J. Cesarean versus vaginal delivery: long-term infant outcomes and the hygiene hypothesis. Clin Perinatol. 2011;38(2):321-31. doi:10.1016/j.clp.2011.03.008
19. Meillat H, Brun C, Zemmour C, de Chaisemartin C, Turrini O, Faucher M, et al. Laparoscopy is not enough: full ERAS compliance is the key to improvement of short-term outcomes after colectomy for cancer. Surg Endosc. 2020;34:2067-75. doi:10.1007/s00464-019-06987-5
20. Uña Orejón R, Mateo Torres E, Huercio Martínez I, Jofré Escudero C, Gómez Rivas J, Díez Sebastián J, et al. Application of ERAS and laparoscopic surgery in the management of patients with bladder cancer. Arch Esp Urol. 2018;71:178-86.
21. Scheib SA, Thomassee M, Kenner JL. Enhanced recovery after surgery in gynecology: a review of the literature. J

Minim Invasive Gynecol. 2018;26:327-43. doi:10.1016/j.jmig.2018.12.010

22. Kiong KL, Vu CN, Yao CM, Kruse B, Zheng G, Yu P, et al. Enhanced recovery after surgery (ERAS) in head and neck oncologic surgery: a case-matched analysis of perioperative and pain outcomes. Ann Surg Oncol. 2021;28:867-76. doi:10.1245/s10434-020-09174-2
23. Olson KA, Fleming RD, Fox AW, Grimes AE, Mohiuddin SS, Robertson HT, et al. The enhanced recovery after surgery (ERAS) elements that most greatly impact length of stay and readmission. Am Surg. 2021;87:473-9. doi:10.1177/0003134820951440
24. Pickens RC, Cochran AR, Lyman WB, King L, Iannitti DA, Martinie JB, et al. Impact of multidisciplinary audit of enhanced recovery after surgery (ERAS) programs at a single institution. World J Surg. 2021;45:23-32. doi:10.1007/s00268-020-05765-y
25. Gustafsson UO, Oppelstrup H, Thorell A, Nygren J, Ljungqvist O. Adherence to the ERAS protocol is associated with 5-year survival after colorectal cancer surgery: a retrospective cohort study. World J Surg. 2016;40:1741-7. doi:10.1007/s00268-016-3460-y
26. Savaridas T, Serrano-Pedraza I, Khan SK, Martin K, Malviya A, Reed MR. Reduced medium-term mortality following primary total hip and knee arthroplasty with an enhanced recovery program: a study of 4,500 consecutive procedures. Acta Orthop. 2013;84:40-3. doi:10.3109/17453674.2013.771298
27. World Health Organization. WHOQOL-BREF: introduction, administration, scoring and generic version of the assessment. Available from: https://www.who.int/tools/whoqol/whoqol-bref/docs/default-source/publishing-policies/whoqol-bref/farsi-whoqol-bref
28. Zychowicz A, Pisarska M, Łaskawska A, Czyż M, Witowski J, Kisielewski M, et al. Patients' opinions on enhanced recovery after surgery perioperative care principles: a questionnaire study. Videosurgery Miniinv. 2019;14(1):27-37. doi:10.5114/wiitm.2018.77261
29. Ferraioli D. EVAN-G score in patients undergoing minimally invasive gynecology oncologic surgery in an enhanced recovery after surgery (ERAS) program. Int J Gynecol Cancer.
30. Fernandez S, Trombert-Paviot B, Raia-Barjat T, Chauleur C. Impact of enhanced recovery after surgery (ERAS) program in gynecologic oncology and patient satisfaction. J Gynecol Obstet Hum Reprod. 2023;52(2):102528. doi:10.1016/j.jogoh.2022.2100
31. Kondo W, Ribeiro R, Zomer MT. Fast-track surgery in intestinal deep infiltrating endometriosis. J Minim Invasive Gynecol. 2014;21:285-90.
32. Relph S, Bell A, Sivashanmugarajan V, Munro K, Chigwidden K, Lloyd S, et al. Cost effectiveness of enhanced recovery after surgery programme for vaginal hysterectomy: a comparison of pre and post implementation expenditures. Int J Health Plann Manage. 2014;29:399-406. doi:10.1002/hpm.2182
33. Bisch S.P and Nelson G. Outcomes of Enhanced Recovery after Surgery (ERAS) in Gynecologic Oncology: A Review. Curr. Oncol. 2022, 29, 631–640. https://doi.org/10.3390/curroncol29020056.
34. Yoong W, Sivashanmugarajan V, Relph S, Bell A, Fajemirokun E, Davies T, Munro K, et al. Can enhanced recovery pathways improve outcomes of vaginal hysterectomy? Cohort control study. J Minim Invasive Gynecol. 2014;21(1):83-9. doi:10.1016/j.jmig.2013.06.007
35. Bahadur A, Kumari P, Mundhra R, Ravi AK, Chawla L, Mahamood M, et al. Evaluate the effectiveness of enhanced recovery after surgery versus conventional approach in benign gynecological surgeries: a randomized controlled trial. Cureus. 2021;13(7):e16527. doi:10.7759/cureus.16527
36. Ferrari F, Forte S, Sbalzer N, Zizioli V, Mauri M, Maggi C, et al. Validation of an enhanced recovery after surgery protocol in gynecologic surgery: an Italian randomized study. Am J Obstet Gynecol. 2020;223:543.e1-14. doi:10.1016/j.ajog.2020.07.003
37. Meyer LA, Lasala J, Iniesta MD, Nick AM, Munsell MF, Shi Q, et al. Effect of an enhanced recovery after surgery program on opioid use and patient-reported outcomes. Obstet Gynecol. 2018;132:281-90. doi:10.1097/AOG.0000000000002735
38. Abdel Fattah AF, Atia AM, Saad DA, Gebaly MA. Comparative study between enhanced recovery and conventional protocols in colorectal surgery. Minia J Med Res. 2020;31(3):337-9.