

ORIGINAL RESEARCH

GYNECOLOGICAL ANESTHESIA

Comparison of outcomes following ERAS versus conventional care in gynecological surgeries: a retrospective study

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ABSTRACT

Background & objective: There have been very limited scale of Enhanced Recovery After Surgery (ERAS) protocol implementation to optimize recovery following surgery in Sri Lanka. We compared perioperative outcomes between ERAS-managed and conventionally managed patients undergoing major gynecological surgeries, stratified by laparoscopic and open approaches.

Methodology: A retrospective cohort study was conducted at Teaching Hospital Peradeniya, Sri Lanka, with 70 laparoscopic cases (35 ERAS, 35 non-ERAS) and 70 open cases (35 ERAS, 35 non-ERAS). Outcomes assessed included hospital length of stay (LOS), bowel recovery, flatus passage, postoperative complications, and 30-day readmissions. Descriptive statistics, Mann–Whitney U tests, and chi-square tests were employed, with significance set at $P < 0.05$.

Results: In laparoscopic cases, ERAS shortened time to flatus (23.4 vs 28.8 hours, $P < 0.001$), bowel opening (25.8 vs 33.6 hours, $P < 0.001$), and total hospital stay (3.17 vs 4.17 days, $P = 0.005$). Postoperative fever was lower with ERAS (2.9% vs 5.7%), with similar readmission rates (5.7%). In open cases, ERAS reduced total stay (4.26 vs 5.83 days, $P = 0.004$), postoperative stay (2.26 vs 3.69 days, $P = 0.002$), and bowel recovery time (32.9 vs 41.5 hours, $P = 0.008$). Readmissions were comparable. (14.3% ERAS vs 8.6% non-ERAS).

Conclusion: ERAS improves recovery, supporting its broader use in gynecological surgery in Sri Lanka to enhance efficiency and outcomes.

Keywords: Enhanced Recovery After Surgery; ERAS; Gynecological Surgical Procedures; Postoperative Period

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1. INTRODUCTION

Enhanced Recovery After Surgery (ERAS) protocols represent a multimodal, evidence-based approach to perioperative care, originally conceptualized in colorectal surgery by Kehlet¹. The protocol combines preoperative counselling, optimal nutrition, minimally

invasive surgical techniques, multimodal analgesia, early mobilization, and early postoperative feeding, with the primary aim of minimizing surgical stress responses and facilitating quicker recovery^{2 3}. Over the past two decades, ERAS has been progressively integrated into

gynaecological surgery, with studies demonstrating reduced length of hospital stay, earlier return of bowel function, decreased opioid consumption, fewer complications, and lower healthcare costs⁴⁻⁵.

Despite these documented benefits, ERAS protocols are applied unevenly across healthcare systems around the world. Adoption is highly challenging in low- and middle-income countries, where limitations in resources, training, and institutional frameworks may constrain perioperative innovation⁶⁻⁷. In Sri Lanka, ERAS usage is sporadic and largely dependent on the preferences of individual clinicians rather than uniform institutional protocols.

Evidence from Sri Lankan context is critical for shaping clinical practice, especially in a setting characterized by scarce hospital beds, crowded surgical wards, and fast patient turnover⁸. International findings suggest that ERAS can reduce length of stay (LOS) by one to two days without increasing readmissions or complications⁹⁻¹⁰. However, demographic and clinical differences, including nutritional status, comorbidity burden, and surgical techniques necessitate validation in the Sri Lankan context. Additionally, the increasing incidence of gynecological malignancies such as ovarian and endometrial cancers underscores the urgency of optimizing perioperative care pathways.^{11,12} Despite the clinical relevance of this topic, there is a gap in country specific data. This study was undertaken to address this by providing locally derived evidence.

Compare perioperative outcomes between ERAS-managed and conventionally managed patients undergoing major gynecological surgeries, stratified by laparoscopic and open approaches.

2. METHODOLOGY

This was a retrospective cohort study comparing outcomes of patients managed under ERAS protocols with those managed under conventional perioperative care (non-ERAS). Two surgical cohorts were evaluated separately: laparoscopic and open gynaecological surgeries.

The study was conducted at the Gynaecology Unit, Teaching Hospital Peradeniya, a tertiary referral centre in Sri Lanka, providing a wide range of gynaecological services including both benign and oncological procedures.

The study included adult female patients aged ≥ 18 years, who underwent elective major laparoscopic or open gynaecological surgery, with a documented perioperative pathway indicating ERAS or conventional management. Emergency gynecological surgeries,

minor procedures (e.g., dilatation and curettage), patients discharged against medical advice, and patients that had been managed with deviations from the ERAS protocol were not included in the ERAS group. Patients with missing or incomplete medical records were not included in the study.

The ERAS cohort included patients operated between January 2023 and December 2024. The non-ERAS cohort included patients operated in 2019, before ERAS was practiced in the unit. Records from 2019 were used, as routine theatre lists were disturbed in years 2020-2023 due to the COVID-19 pandemic. Patients were further grouped by the surgical approach (laparoscopic vs open). Each group included 35 patients, giving a total of 140 participants.

The independent variable was type of perioperative care (ERAS vs non-ERAS). Dependent outcomes included, primary outcomes, total length of hospital stay (Length of stay), postoperative LOS, time to bowel opening, time to flatus. Secondary outcomes included, postoperative complications (surgical site infection, fever, paralytic ileus, thromboembolism, other complications), intraoperative adverse events (if documented), and 30-day readmission.

Limitations of the retrospective design include the susceptibility to missing data and unmeasured confounding. To minimize confounding by anesthesia technique, the open surgery cohort was balanced so that, in both ERAS and non-ERAS groups, 10 procedures were conducted under spinal anesthesia (SA) and 25 under general anesthesia (GA). In the laparoscopic cohort, all cases were performed under GA. The cases in the open surgery group were selected as 5 open myomectomy cases, 10 vaginal hysterectomy cases and 15 total abdominal hysterectomy cases with or without bilateral salpingo-oophorectomy/ salpingectomy to minimize confounding effects of the surgery type. Other potential confounding was reduced by restricting to elective cases.

In the ERAS group the following protocol had been implemented. Patients that had deviations of the protocol based on clinical decision making were not included in the study.

During pre-operative phase, patients were counselled regarding the ERAS plan, early feeding, mobilization, and discharge expectations. Pre-operative optimization included hemoglobin assessment, nutritional screening, and management of anemia. Diabetic control (glucose/HbA1c) and venous thromboembolism (VTE) risk reviewed, with prophylaxis prescribed where indicated. Fasting protocols limited clear fluids to ≤ 2 hours and solids to ≤ 6 hours before anesthesia.

Antibiotic prophylaxis was given 60 minutes before the incision. Routine bowel preparation was not done.

During the post-operative phase, patients were asked to take clear fluids within 2 hours and semi-solids within 6 hours after the surgery. Early mobilization aimed for sitting within 6 hours and walking within 12 hours. Regular multimodal analgesia was continued, with opioids used only as a rescue option. Urinary catheters were removed as early as possible. Thromboprophylaxis was continued until full mobilization, extended in high-risk patients.

For patients managed under the conventional (non-ERAS) pathway, perioperative care followed the routine hospital practice traditionally used at the Professorial Gynecology Unit, Teaching Hospital Peradeniya, prior to ERAS implementation. The protocols were dependent on clinician preference. The following areas were considered as key features of cases that were included in the conventional study group.

During the pre-operative phase, patients were admitted one day or more before surgery for routine preparation. Preoperative counselling regarding early mobilization, oral intake, and discharge planning was not standardized. Fasting was commenced from midnight prior to surgery. Routine bowel preparation and overnight fasting were commonly practiced. Prophylactic antibiotics were administered at variable times, often at induction or after incision.

During the Post-operative phase, oral intake was delayed until the passage of flatus or bowel sounds, and intravenous fluids were continued until then. Mobilization was generally initiated after 24–48 hours, depending on the patient's condition and the surgeon's assessment. Analgesia was predominantly opioid-based, given on demand rather than scheduled, and bowel care was not routinely started early. Catheter removal was typically performed after 24 hours or later, and thromboprophylaxis continuation was not protocolled. Discharge criteria were subjective and varied by clinician.

Data were retrospectively extracted from bed-head tickets and operative notes using a structured data extraction form. Continuous outcomes were recorded in hours or days, while categorical outcomes were recorded as present/absent or by frequency counts.

Sample size calculation was based on detecting a 1-day reduction in length of hospital stay with ERAS, assuming a standard deviation of 2 days, 80% power, and $\alpha = 0.05$. This yielded a requirement of 32 patients per group. Allowing for 10% missing data, 35 patients were included in each group, resulting in 70 laparoscopic cases and 70 open cases ($n = 140$).

Statistical Analysis

Descriptive statistics (mean, median, SD, range) were used for continuous variables, while frequencies and

percentages summarized categorical outcomes. Between-group comparisons employed Mann–Whitney U tests for continuous outcomes. Effect sizes were calculated using rank biserial correlation. Statistical significance was set at $P < 0.05$. Analyses were conducted using jamovi (version 2.7).¹³

Ethical approval was obtained from the Ethics Review Committee, Faculty of Medicine, University of Peradeniya. As this was a retrospective record-based study, informed consent was waived off. Data confidentiality was maintained by anonymizing patient records and restricting access to investigators.

3. RESULTS

A total of 140 women undergoing elective major gynecological surgery were included, with 70 in the laparoscopic cohort and 70 in the open cohort. Within each cohort, 35 patients were managed under ERAS protocols and 35 under conventional care. Mean age in the laparoscopic cohort was 35.4 years (ERAS) and 30.9 years (non-ERAS), while in the open cohort mean ages were 51.3 (ERAS) and 49.8 years (non-ERAS). In the open cohort, anesthesia type was evenly distributed to minimize confounding: 25 patients underwent GA and 10, SA in both ERAS and non-ERAS groups. All laparoscopic cases were performed under GA.

Patients who had laparoscopic surgery and were managed under ERAS demonstrated significantly faster recovery compared to non-ERAS. Mean time to flatus was 23.4 vs 28.8 hours ($P < 0.001$), and mean time to bowel opening was 25.8 vs 33.6 hours ($P = 0.004$). ERAS patients also had a shorter total LOS (3.17 vs 4.17 days, $P = 0.005$). Postoperative fever was 2.9% in ERAS vs 5.7% in non-ERAS; surgical site infection occurred only in the non-ERAS group (2.9%); readmission rates were equal (5.7%).

The post-operative outcomes in laparoscopic surgeries, regarding continuous variables, e.g. LOS, time to pass flatus and time to bowel opening are given in Table 1. The post-operative outcomes, regarding categorical variables fever was low in both groups and not statistically different ($P = 0.56$), with only one case (2.9%) in the ERAS group and two cases (5.7%) among non-ERAS patients. Paralytic ileus was not observed in either cohort (Table 2). Other minor post-operative complications occurred infrequently—one case of intraperitoneal hemorrhage in the ERAS group and two cases (urinary tract infection and intraperitoneal hemorrhage) in the Non-ERAS group—yielding no significant difference (P

= 0.31). Readmissions within 30 days were identical in both groups (two cases each, 5.7%; $P = 1.000$).

ERAS patients undergoing open surgery showed significant advantages in recovery. Mean total Length of stay was 4.26 vs 5.83 days ($P = 0.004$), and postoperative LOS was 2.26 vs 3.69 days ($P = 0.002$).

Gastrointestinal recovery was faster in ERAS: bowel opening (32.9 vs 41.5 hours, $P = 0.008$) and flatus passage (38.1 vs 48.6 hours, $P = 0.003$).

Postoperative fever and other complications were infrequent and distributed without significant between-group differences. Thirty-day readmission did not differ significantly (14.3% ERAS vs 8.6% non-ERAS).

Post-operative fever occurred in 4 patients (11.4%) in the ERAS group and 7 patients (20.0%) in the non-ERAS group ($P = 0.324$). Paralytic ileus was rare, seen in only one patient from each group ($P = 1.000$). Other post-operative complications were

infrequent: acute urinary retention occurred in one patient per group, hypertensive crises in one ERAS and three non-ERAS patients, while isolated cases of headache, hyperkalemia, post-operative hemorrhage, anemia, pulmonary embolism, and sinus bradycardia were reported singly. None of these differences were statistically significant ($P = 0.532$). Readmission within

30 days occurred in five ERAS patients (14.3%) and three non-ERAS patients (8.6%) ($P = 0.452$) (Tables 3 & 4).

Across both laparoscopic and open cohorts, ERAS consistently improved recovery outcomes, particularly

Table 1: Postoperative outcomes in laparoscopic surgeries - continuous variables

Variable	ERAS Group (n = 35)	Non-ERAS Group (n = 35)	P-value
Total hospital stay (days)	3.17 ± 1.04	4.17 ± 1.67	0.005
Post-operative hosp stay (days)	1.40 ± 0.55	1.57 ± 0.56	0.172
Time to pass flatus (hours)	23.43 ± 9.25	28.80 ± 7.53	< 0.001
Time to bowel opening (hours)	25.83 ± 10.35	33.60 ± 11.57	0.004

Data presented as mean ± SD; P < 0.05 considered as significant

Table 2: Postoperative outcomes in laparoscopic surgeries - categorical variables

Variable	ERAS Group (n = 35)	Non-ERAS Group (n = 35)	χ^2 / Fisher's test	P-value
Post-operative Fever	1 (2.85)	2 (5.70)	Fisher's Exact	0.56
Paralytic Ileus	0	0	—	—
Readmission ≤ 30 days	2 (5.70)	2 (5.70)	$\chi^2 = 0.00$ (df = 1)	1.000

Data presented as n (%); P < 0.05 considered as significant

Table 3. Postoperative outcomes in open surgeries- Continuous Variables

Variable	ERAS Group (n = 35)	Non-ERAS Group (n = 35)	P-value
Age (years)	51.3 ± 14.9	49.8 ± 11.6	—
Total Hospital Stay (days)	4.26 ± 1.15	5.83 ± 4.63	0.004
Post-operative hospital stay (days)	2.26 ± 0.95	3.69 ± 4.52	0.002
Time for bowel opening (hours)	32.91 ± 12.47	41.54 ± 15.61	0.008
Time to pass flatus (hours)	38.06 ± 13.80	48.57 ± 17.02	0.003

Data presented as mean ± SD; P < 0.05 considered as significant

Table 4: Postoperative outcomes in open surgeries- Categorical Variables

Variable	Category	ERAS Group (n = 35)	Non-ERAS Group (n = 35)	χ^2	P-value
Anaesthesia Type	GA	25 (71)	25 (71)	—	—
	SA	10 (29)	10 (29)	—	—
Post-operative Fever		4 (11)	7 (12.95)	0.971	0.324
Paralytic Ileus		1 (2.85)	1 (2.85)	0.000	1.000
Readmission ≤ 30 days		5 (14.25)	3 (8.55)	0.565	0.452

Data presented as n (%); P < 0.05 considered as significant

gastrointestinal function and Length of stay. There were statistically no significant differences in major postoperative complications or 30-day readmission rates between ERAS and conventional care groups.

4. DISCUSSION

ERAS was consistently associated with earlier gastrointestinal recovery, shorter hospital stay, and comparable complication and readmission rates across laparoscopic and open gynecological surgeries at a tertiary center in Sri Lanka, reinforcing the safety and effectiveness of ERAS in the local context.

Among laparoscopic cases, ERAS significantly reduced time to flatus and bowel opening, with corresponding reductions in total hospital stay. Mobilization and immediate postoperative stay were similar between groups, suggesting that laparoscopic surgery itself already facilitates faster recovery, with ERAS providing additional benefit primarily in gastrointestinal outcomes. The trend towards fewer fevers and infections in ERAS patients is consistent with international evidence of complication reduction under ERAS.^{9,10}

In open procedures, ERAS produced marked reductions in both total and postoperative Length of stay, alongside faster gastrointestinal recovery. The benefit was greater in open surgery cases, reflecting its higher baseline morbidity. Balancing anesthetic technique (10 x spinal and 25 x general anesthesia per group) minimized confounding and supports the robustness of the findings.

The observed benefits of ERAS likely reflect multiple synergistic mechanisms. Early oral intake and avoidance of prolonged fasting accelerate gastrointestinal motility; multimodal analgesia reduces opioid exposure and ileus risk; and early mobilization improves circulatory and pulmonary function, collectively facilitating earlier discharge.

Length of stay was consistently reduced in both laparoscopic and open cohorts, though the patterns differed. In laparoscopic cases, ERAS patients had significantly shorter total Length of stay, but postoperative Length of stay did not differ significantly. A likely explanation is that patients in the non-ERAS group were admitted earlier before surgery, extending their overall hospitalization independent of recovery speed.

Laparoscopic surgery also inherently facilitates earlier discharge, limiting the scope for ERAS to influence postoperative ward stay. In contrast, open surgery patients benefitted from significant reductions in both total and postoperative Length of stay, reflecting the cumulative effect of earlier bowel recovery, structured mobilization, and standardised discharge planning under

ERAS. Studies from regional low and middle income countries have shown reduced LOS(5.1 vs 8.3 days), postoperative pain (score 4.2 vs 6.5) and recovery time (12.3 vs 17.5 days) with ERAS protocols compared to conventional care, supporting the findings of this study.¹⁴

From a health systems perspective, even a 1–1.5 day reduction in Length of stay per patient has major implications in Sri Lanka, where overcrowded surgical wards and limited hospital beds are pressing challenges⁸. These findings mirror global meta-analyses reporting average Length of stay reductions of 1–2 days with ERAS implementation.^{9,10}

Strengths include inclusion of both laparoscopic and open cohorts, deliberate balancing of anesthetic technique in open surgery to reduce confounding, and provision of context-specific evidence from Sri Lanka.

5. LIMITATIONS

Limitations include the retrospective design with susceptibility to missing data and unmeasured confounding (e.g., comorbidity severity, surgeon experience), and modest sample size limiting power for rare outcomes. Another potential limitation of this study is the comparison of cohorts from different time periods, with the non-ERAS group from 2019 and the ERAS group from 2023–24. Advances in surgical techniques, perioperative care, institutional protocols and post pandemic healthcare delivery during this interval may have influenced outcomes independently of ERAS implementation and should be considered when interpreting the results.

6. CONCLUSION

ERAS protocols improved recovery outcomes in both laparoscopic and open gynaecological surgeries at a tertiary hospital in Sri Lanka. ERAS was associated with shorter hospital stays, earlier return of bowel function, and comparable complication and readmission rates relative to conventional perioperative care. The impact of ERAS was most pronounced in open procedures, where both total and postoperative hospital stays were significantly reduced. In laparoscopic cases, total LOS was shorter while postoperative stay did not differ significantly, likely reflecting the minimally invasive nature of laparoscopy and earlier preoperative admissions among non-ERAS patients.

These findings provide strong evidence to support the incorporation of ERAS protocols into national surgical policy, offering a strategic approach to optimizing limited surgical resources and improving patient outcomes across Sri Lanka.

7. Data availability

The numerical data generated during this research is available with the authors.

8. Ethical considerations

Ethical approval was obtained from the University Ethical Committee. As it was a retrospective study, patients consent was deemed unnecessary..

9. Conflict of interest

All authors declare that there was no conflict of interest.

10. Funding

The study utilized the hospital resources only, and no external or industry funding was involved.

11. Authors' contribution

Sampath Gnanarathne - Concept and design of the study, acquisition of data, analysis and interpretation of data, drafting the paper, revising it critically for important intellectual content, final approval of the version to be published, Agreement to be accountable for all aspects of the work

Thumula Rathnayaka - acquisition of data, analysis and interpretation of data, drafting the paper, final approval of the version to be published, agreement to be accountable for all aspects of the work

Miyasi Jayawardana - acquisition of data, analysis and interpretation of data, drafting the paper, final approval of the version to be published, agreement to be accountable for all aspects of the work

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