SRIWIJAYA JOURNAL OF MEDICINE

Perioperative and Postoperative Management in Gynecologic Oncologic Patients: A Narrative Review

Nurkulis[1*], Patiyus Agustiansyah[2]

[1]Department of Obstetrics and Gynecology, Faculty of Medicine, Sriwijaya University, Mohd General Hospital. Hoesin Palembang, South Sumatra, Indonesia
[2]Oncology Division, Department of Obstetrics and Gynecology, Faculty of Medicine, Sriwijaya University, Palembang, Indonesia
*E-mail: drnurkulis@gmail.com

Abstract

Gynecologic cancers, particularly cervical, ovarian, and endometrial cancers, remain among the leading causes of mortality in women. Surgery, the cornerstone of treatment, is often associated with significant perioperative risks, necessitating careful evaluation and management to optimize outcomes. This review analyses perioperative and postoperative factors influencing morbidity and mortality in gynecologic oncology and evaluates the role of Enhanced Recovery After Surgery (ERAS) protocols in improving outcomes. A literature search by Google Scholar, PubMed, and ScienceDirect identified eight relevant evidence-based studies published within the last decade. Findings demonstrate that ERAS accelerates recovery, reduces complications, and lowers healthcare costs. Key components—such as patient education, multimodal analgesia, bowel function optimization, and early mobilizations significantly enhance postoperative recovery. Patients with comorbid endocrine, cardiovascular, renal, and electrolyte disorders require intensive monitoring and tailored management to prevent complications. Overall, the application of ERAS in gynecologic oncology improves recovery, reduces morbidity, and enhances quality of life, particularly when combined with vigilant monitoring in high-risk patients.

Keywords: Perioperative Management, Postoperative Management, Gynecologic Oncology, Postoperative Complications, Enhanced Recovery After Surgery (ERAS)

1. Introduction

Cancer is one of the leading causes of death worldwide. According to global cancer statistics in 2020, breast cancer, colorectal cancer, lung cancer, and cervical cancer ranked highest in incidence among women, with rates of 24.5%, 9.4%, 8.4%, and 6.5%, respectively. In the field of gynecology, cervical cancer has an incidence rate of 6.6%, followed by endometrial cancer (4.4%) and ovarian cancer (3.4%). A study conducted at Dr. Hasan Sadikin General Hospital in Bandung between 2015 and 2016, involving 552 patients with cervical, endometrial, and ovarian cancer, showed a postoperative mortality rate of 3.6%, with significant complications including bleeding, and 8.4% of patients were admitted to the ICU. This poses a challenge in the implementation of perioperative and postoperative management, particularly Enhanced Recovery After Surgery (ERAS) in the field of obstetrics and gynecology.[1,2,3,4]

The Enhanced Recovery After Surgery (ERAS) program has been developed to maintain patients' physiological stability during the perioperative period and accelerate recovery without increasing the risk of complications.[5,6,7]

Studies comparing the implementation of ERAS with conventional practices in obstetric and gynecological cases have shown faster recovery and a significant reduction in the length of hospital stay. In vaginal hysterectomy cases, the application of ERAS can reduce the length of stay by up to 50%, as well as decrease the need for intravenous fluids and morphine. A meta-analysis also revealed that implementing ERAS in gynecologic oncology can reduce the length of

hospital stay by 1.6 days, lower the incidence of complications by 32%, and result in cost savings for patient care.[7,8,9,10,11]

The purpose of this paper is to emphasize perioperative and postoperative management through the mapping of ERAS components with levels of evidence and recommendations from the latest literature sources.

2. Method

The literature search for this review was conducted through several databases, namely Google Scholar, PubMed, and Science Direct, using keywords ((Perioperative Management) AND (Postoperative Management) AND (Gynecologic Oncology) AND (Post Operative Complications) AND (ERAS)). The inclusion criteria were limited to articles published after 2021, available in full text, written in English or Indonesian, and relevant to the subject matter (Fig. 1).

Article selection was performed straightforwardly by screening titles and abstracts, followed by reading the full texts of studies considered pertinent. Publications that did not align with the main discussion were set aside without detailed documentation of the exclusion process. In total, eight articles were retained to support the discussion presented in this review (Table 1).

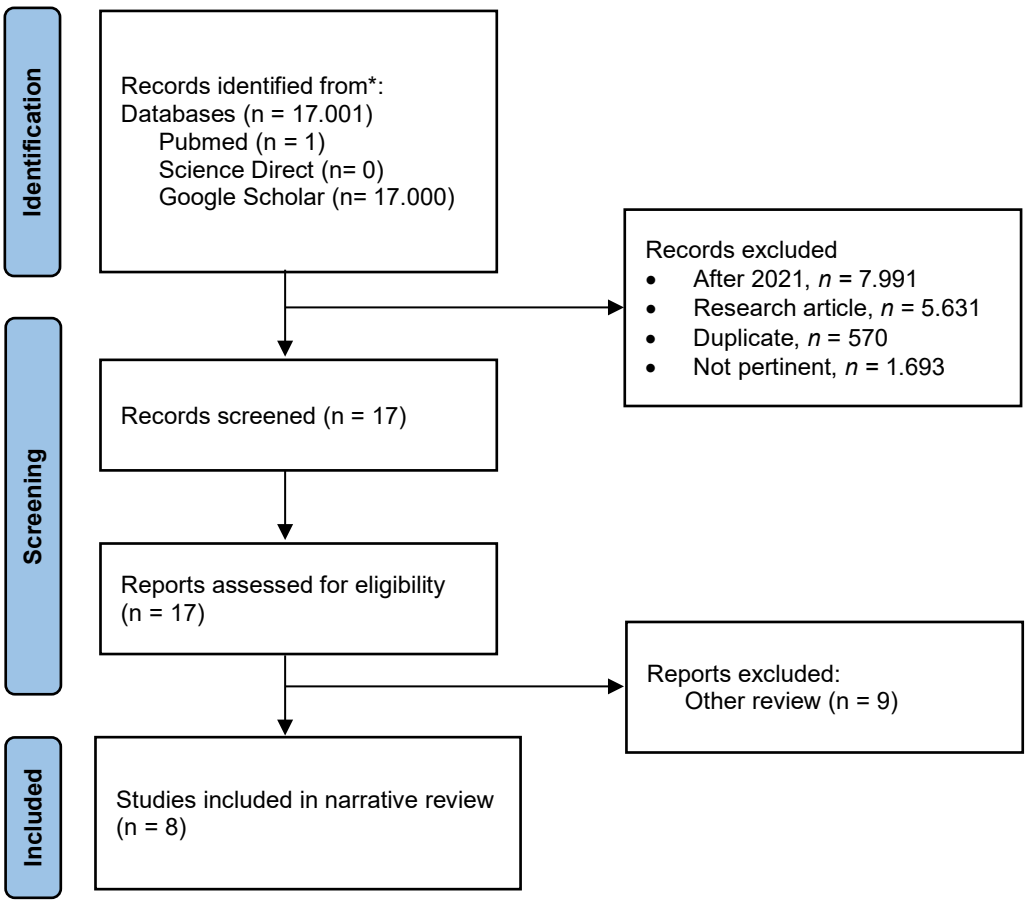

Figure 1. Study Selection Flow

Table 1. List of Studies Included In Literature Review and Their Key Information

Author(s)	Subjects	Location	Age	Methods	Result
Joshi, 2021[25]	724 women who underwent exploratory laparotomy (benign and malignant indications, excluding bowel resection) (360 pre-ERAS, 364 ERAS)	Willow Grove, Pennsylvania	The median age was 56 years in the non-ERAS group and 57 years in the ERAS group.	This study compared outcomes between patients managed with traditional perioperative care (non-ERAS) and those managed under the Enhanced Recovery After Surgery (ERAS) protocol. Compliance with ERAS components was assessed during the first two years of implementation, along with analysis of various perioperative outcomes.	Patients in the ERAS cohort demonstrated a 50% reduction in total postoperative narcotic use during hospitalization (median 34 vs. 68 MMEs; $p < 0.001$) and within the first 72 hours postoperatively (34 vs. 60 MMEs; $p < 0.005$). They also had a shorter median hospital stay (3 vs. 4 days; $p < 0.001$), with a greater proportion discharged within 3 days (50.8% vs. 19.4%; $p < 0.001$).
Kim, 2022[14]	202 women undergoing minimally invasive hysterectomy for gynecologic malignancies	Ontario, Canada	The mean age in the pre-intervention cohort was 62 years (SD 10.6), compared with 59 years (SD 10.5) in the post-intervention cohort.	This study implemented a comprehensive perioperative program grounded in Enhanced Recovery After Surgery (ERAS) principles within a quality improvement framework. Interventions spanned preoperative, intraoperative, and postoperative phases, aiming to increase same-day discharge rates following minimally invasive hysterectomy for gynecologic cancer. Outcomes from 102 consecutive patients in the post-intervention cohort were compared with a historical control group of 100 patients from the pre-intervention period.	Implementation of the perioperative program markedly increased same-day discharge rates from 29% pre-intervention to 75% post-intervention ($p < 0.001$). The post-intervention cohort was slightly younger (mean age 59 vs. 62 years; $p = 0.038$) and had shorter median operative times (180 vs. 211 minutes; $p < 0.001$), while BMI and comorbidity profiles were comparable between groups. Notably, there was no rise in 30-day perioperative complications or readmissions, with reoperation, emergency visits, morbidity, and mortality remaining low and similar across cohorts (e.g., reoperation 3% vs. 1%, $p = 0.370$). The main causes of overnight admission were nausea/vomiting (16%), complications of pre-existing

					comorbidities (12%), and urinary retention (8%).
Khudaer, 2024[26]	400 women who underwent gynecological surgery	Al-Kut City, Iraq	In age from 13 to 72 years, with a mean age of 31.5 ± 10 years	This study employed a cross-sectional design with a seven-month data collection period, from October 16, 2023, to May 16, 2024. Data collected included demographic characteristics, medical and surgical history, and the types of postoperative complications.	Of all complications, 90.3% occurred within 48 hours, 51.3% during surgery, and 50.2% after 48 hours. The most frequent were hemorrhage, anesthesia-related issues, and cardiac arrhythmia. Significant risk factors included preoperative blood transfusion, ICU stay, age, parity, prior surgery, and hypertension.
Li, 2025[16]	315 women with gynecologic malignancies (195 cervical, 85 endometrial, 35 ovarian cancers) undergoing TU-LESS	China	The mean age of the patients included in the study was 47.48 ± 8.77 years.	This study analyzed the outcomes of patients with gynecologic malignancies who underwent transumbilical laparoendoscopic single-site surgery (TU-LESS) performed by a single experienced surgeon.	The study included 315 patients with gynecologic malignancies who underwent TU-LESS within ERAS protocols. The mean operative time was 273.71 ± 87.12 minutes, with an average estimated blood loss of 166.87 ± 237.09 mL. Postoperative recovery was favorable, with a mean time to first flatus of 43.68 ± 29.75 hours and a mean hospital stay of 5.30 ± 2.42 days. Perioperative complications were rare, with minimal intraoperative events such as vascular, gastrointestinal, or nerve injury. Postoperative complications, including infection, embolism, fistula, intestinal obstruction, or readmission—were also infrequent, supporting the safety and feasibility of TU-LESS in this patient population.

Lindemann, 2023[15]	439 women undergoing laparotomy for suspected or advanced ovarian cancer	Oslo, Norway.	No information	Patients were prospectively enrolled into two cohorts: a pre-ERAS group (May 15, 2017–May 6, 2018) and a post-ERAS group (May 7, 2018–June 3, 2019). They were further stratified by surgical extent, with cohort 1 comprising patients with advanced disease and cohort 2 including those with suspicious pelvic tumors.	Median fasting times decreased from 16.0 to 13.1 hours for solids and from 11.0 to 3.7 hours for fluids following ERAS implementation, reflecting improved adherence to fasting guidelines. Perioperative fluid administration was also reduced, with median rates declining from 15.8 mL/kg/hour to 11.5 mL/kg/hour ($p < 0.001$). Regarding clinical outcomes, a significant reduction in hospital stay was observed only in the suspicious pelvic tumor cohort (cohort 2), with mean duration decreasing from 4.6 to 4.3 days ($p = 0.026$).
Nuermanguli, 2025[13]	187 patients underwent elective laparoscopic procedures between November 2022 and December 2023. Of these, 92 patients were assigned to the ERAS group and 95 patients to the conventional care group	China	The median age of participants was 38 years (interquartile range 26–52 years)	The ERAS protocol comprised preoperative education and psychological counseling, modified fasting (6 hours for solids, 2 hours for clear fluids), oral carbohydrate loading, omission of mechanical bowel preparation, early oral hydration, mobilization within 24 hours, gum chewing, urinary catheter removal within 12–24 hours, and thromboprophylaxis. In contrast, the control group followed conventional perioperative care, including 12-hour fasting, routine mechanical bowel preparation, and standard postoperative management.	The study found that patients managed with ERAS had faster gastrointestinal recovery (first flatus: 15.5 ± 1.7 h vs 21.2 ± 3.5 h, $P < .001$), shorter hospital stays (4.9 ± 0.9 vs 6.3 ± 1.2 days, $P < .001$), and lower costs (13,960 ± 1967 vs 15,270 ± 2856 yuan, $P < .001$) compared with conventional care. Postoperative stress was reduced (cortisol, $P = .012$), nutritional status was better preserved ($P < .001$), and patient satisfaction was higher (100% vs 93.7%, $P = .042$). These results confirm ERAS as a more effective perioperative strategy.

Radha, 2025[19]	180 women who underwent major gynecologic surgery, divided into two groups: Pre-ERAS (90 patients) and ERAS (90 patients).	Hubballi, India	The participants were aged between 18 and 65 years, with a mean age of 45.9 ± 7.2 years in the Pre-ERAS group and 46.5 ± 7.9 years in the ERAS group.	This study employed a prospective case-control design. The Pre-ERAS group received conventional perioperative care, while the ERAS group was managed with a standardized protocol comprising preoperative education, carbohydrate loading, limited bowel preparation, standardized fluid management, early mobilization, early oral feeding, and multimodal analgesia.	Patients in the ERAS group demonstrated faster postoperative recovery. Early bowel function return (<4 hours) occurred in 8.9% of ERAS patients versus none in the Pre-ERAS group, and all ERAS patients ambulated within 24 hours compared with 57.8% in the Pre-ERAS group. Pain control was superior, with 77.8% of ERAS patients reporting a score of 3 by postoperative day three, compared to 26.7% in the Pre-ERAS group. Complication rates were lower with ERAS (13.3% vs. 31.1%), with no cases of paralytic ileus observed compared to 6.7% in the Pre-ERAS cohort. Hospitalization was also shorter: 81.1% of ERAS patients were discharged within seven days and 71.1% by day four, whereas only 38.9% and 2.2% of Pre-ERAS patients met these benchmarks, respectively.
Tong, 2025[20]	101 women undergoing surgery for gynecological malignancies	Jiangsu Province, China	The mean age of patients in the post-matching ERAS group was 59.3 ± 9.1 years, compared with 60.5 ± 8.6 years in the conventional care group.	This study compared outcomes between patients receiving ERAS-based nursing interventions and those receiving conventional perioperative care. Participants were divided into two groups: the ERAS intervention group (n = 41), which received specialized ERAS nursing protocols, and the conventional care group (n = 60).	Patients in the ERAS intervention group had significantly higher rates of early oral intake resumption (95.1% vs. 65.0%, $p < 0.01$) and ambulation within 24 hours (92.7% vs. 58.3%, $p < 0.001$). They also experienced shorter hospital stays (5.3 ± 1.2 vs. 6.8 ± 1.5 days, $p < 0.001$) and lower overall complication rates (14.6% vs. 29.3%, $p = 0.04$), including fewer pulmonary infections (4.9% vs. 14.6%, $p = 0.03$) and DVT events (2.4% vs. 9.8%, $p = 0.05$). On postoperative day 7, psychological

	health scores were significantly better (10.2 ± 3.1 vs. 14.5 ± 4.2, $p < 0.001$). Additional benefits included reduced pain scores (VAS), improved nutritional and functional recovery (Barthel Index), and fewer postoperative complications overall.

3. Discussion

3.1. Enhanced Recovery After Surgery (ERAS)

Enhanced Recovery After Surgery (ERAS) is an evidence-based protocol designed to reduce surgical stress, enhance recovery, and minimize opioid use in major surgeries. Key components include patient education to reduce anxiety, multimodal pain management with non-opioid analgesics and regional anesthesia, and early mobilization to prevent complications like deep vein thrombosis and pneumonia. The protocol also supports gastrointestinal recovery by avoiding routine nasogastric tubes, using goal-directed fluid therapy, and promoting early oral intake.[12]

Postoperative complications, including pulmonary infections and deep vein thrombosis (DVT), were less frequent, with pulmonary infections decreasing from 12.5% to 4.9%, and DVT from 8.3% to 2.4%.[13] However, in advanced cancer cases, more severe complications were observed post-ERAS, though no direct causal relationship was established.[14]

The ERAS guidelines, updated for gynecologic oncology in 2019 and 2023, aim to optimize perioperative care by recommending clear liquids up to 2 hours before surgery and preoperative carbohydrate loading to reduce insulin resistance. The use of NSAIDs, acetaminophen, and gabapentinoids is encouraged to reduce postoperative opioid use, with caution in elderly patients. Penicillin-allergic patients can safely receive cephalosporins for prophylaxis unless they have a severe history.[9,10] Opioid use was also significantly reduced in the ERAS group, with oral morphine equivalents (MMEs) decreasing from a median of 136 mg pre-ERAS to 116 mg post-ERAS (Figs. 2 and 3).[15,16]

Intraoperative analgesia favors wound infiltration and transversus abdominis plane (TAP) blocks over thoracic epidural anesthesia (TEA) to reduce complications. Early removal of urinary catheters and dual venous thromboembolism (VTE) prophylaxis are recommended to prevent infections and promote early mobilization. The guidelines also stress multimodal pain management and a tiered opioid prescribing approach post-discharge (Figs. 2 and 3).[9,10]

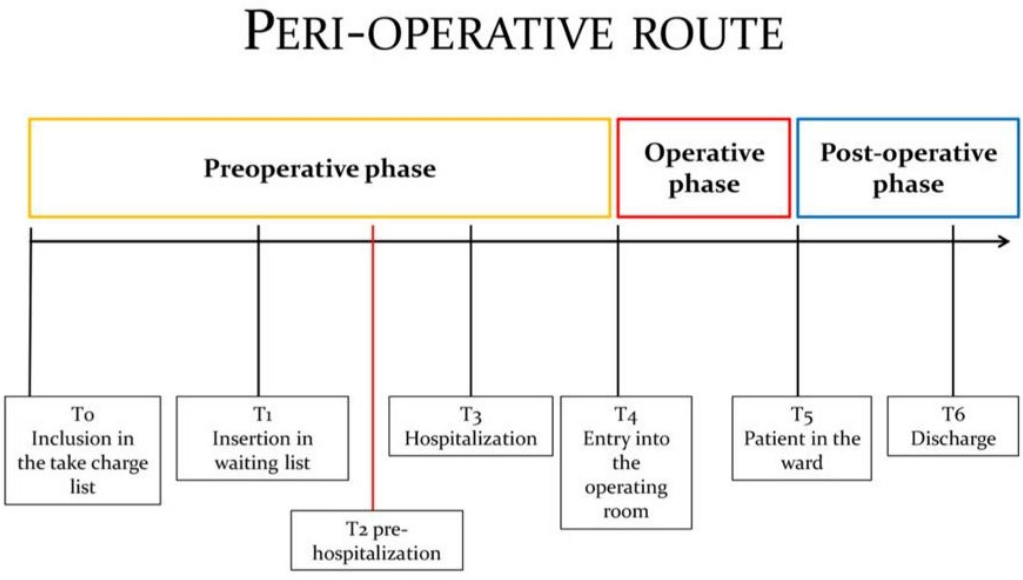

Figure 2. Perioperative Pathway[21]

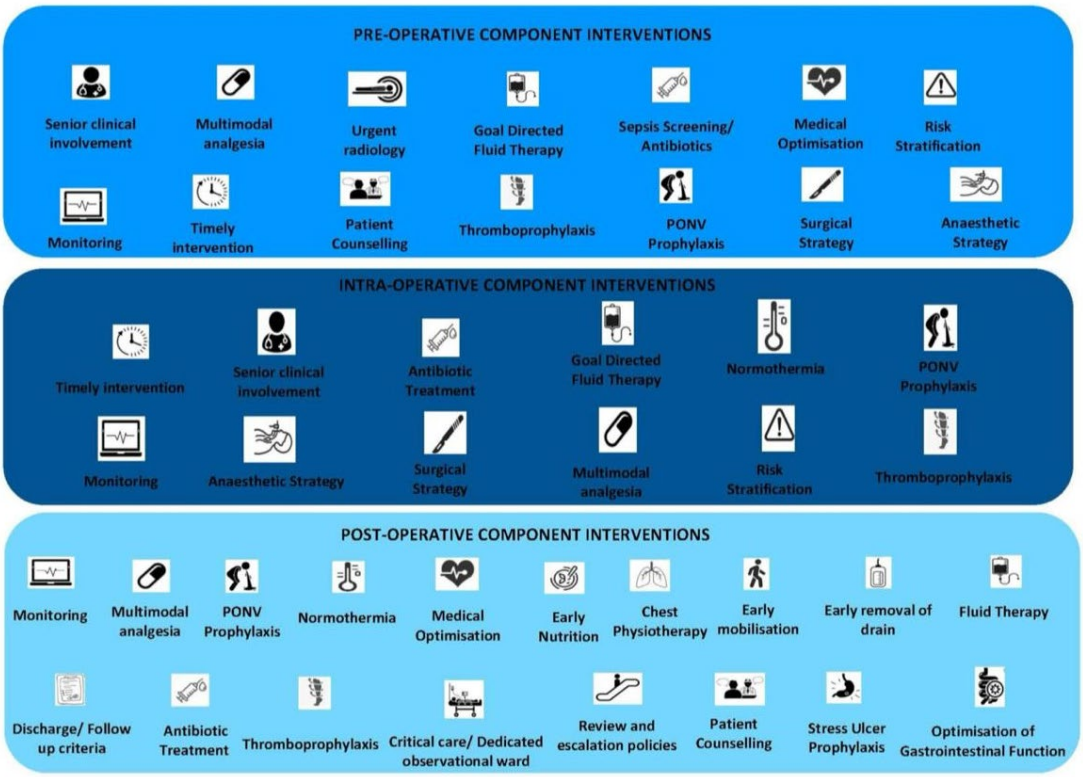

Figure 3. Component Intervention[22]

ERAS-based same-day discharge programs improve patient satisfaction and reduce costs, but the main challenge lies in consistent implementation across healthcare settings. Overcoming barriers to adoption through education and communication of ERAS' economic benefits is crucial for broader acceptance.[9,10] Studies report a reduction in Length of Stay (LOS), with patients undergoing surgery for suspected pelvic tumors experiencing a decrease from 4.6 to 4.3 days.[15] Additionally, for ovarian cancer patients, the median time for the first passage of flatus was 43.68 hours, indicating faster recovery.[16]

3.2. Perioperative Evaluation

Pre-admission Counseling, Information, and Education

Patient education is essential in the ERAS protocol, particularly in gynecologic oncology, to optimize perioperative care and enhance recovery. The ERAS guidelines emphasize educating patients on key aspects of their surgical journey. Preoperatively, clear information about the surgery, anesthesia, and pain management helps reduce anxiety and prepare patients mentally and physically. Nutritional guidance, including carbohydrate loading and proper hydration, supports the body's ability to handle surgery and promotes faster recovery. [9,10]

Education on pain management focuses on multimodal approaches, minimizing opioid use while ensuring comfort. Early mobilization post-surgery is emphasized to prevent complications like DVT and pneumonia and to speed up functional recovery. Patients are also educated on gastrointestinal recovery practices, such as avoiding routine nasogastric tubes and encouraging early oral intake to reduce ileus. [9,10]

Postoperatively, patients receive guidance on managing pain, medications, and activities, ensuring a smooth recovery process. Successful education depends on

coordinated efforts from the surgical team, including surgeons, anesthesiologists, nurses, and nutritionists.[9,10]

Prehabilitation

Prehabilitation is a multimodal strategy applied before surgery to optimize patients' physical and psychological readiness. It typically involves aerobic and resistance exercises to enhance fitness, alongside psychological interventions to reduce stress. While evidence in gynecologic oncology remains limited, studies in colorectal and other abdominal surgeries show that preoperative training lowers complication risks and improves recovery. Integrating prehabilitation into the ERAS protocol may enhance postoperative outcomes, though further research is needed to confirm its effectiveness in gynecologic cancer patients.[10,17,18]

Perioperative Bowel Preparation

Bowel preparation in gynecologic oncology, according to the ERAS guidelines (2019 and 2023), is recommended only in specific cases. Routine bowel preparation is not advised for most gynecologic surgeries, particularly those without bowel resection. Studies show that it does not significantly reduce surgical site infections (SSIs) or complications in these procedures and can lead to unnecessary discomfort. Bowel preparation is indicated when colon resection is planned, as it can help reduce infection risks. In these cases, oral antibiotics are recommended, with mechanical bowel preparation considered for high-risk procedures. The combination of oral antibiotics alone has shown sufficient benefit, and additional mechanical preparation does not offer further advantages.[9,10]

The ERAS guidelines advocate for limiting bowel preparation to high-risk surgeries, such as colon resections or cytoreductive surgeries, and recommend avoiding routine bowel preparation for most other gynecologic oncology procedures. This approach aims to enhance patient comfort while maintaining effective infection prevention.[9,10]

Clinical Feature	Points
Active cancer (on treatment, treated in the last 6 months or palliative)	1
Paralysis, paresis or plaster immobilisation of the lower limb	1
Bedridden for 3 days or more, or major surgery in the past 12 weeks requiring general or regional anaesthesia	1
Localised tenderness along the distribution of the deep venous system	1
Entire leg swollen	1
Calf Swelling 3 cm larger than the symptomatic side	1
Pitting oedema confined to the symptomatic leg	1
Collateral superficial veins (non-varicose)	1
Previous DVT	1
Alternative diagnosis is at least as likely as DVT	-2
Clinical probability simplified score	Points
DVT likely	2 points or more
DVT unlikely	1 point or less

Figure 4. Wells Score for DVT Diagnosis[23]

Table 2. Recommendations for DVT Prophylaxis[9,10]

Risk Level	Prophylaxis Recommendation	Duration
Low Risk	Mechanical prophylaxis (e.g., graduated compression stockings or pneumatic compression devices)	Postoperative day 1 (or until early mobilization)
High Risk	Mechanical prophylaxis - Chemical prophylaxis (e.g., low molecular weight heparin or unfractionated heparin)	Preoperative and continued until discharge
High Risk (Extended Prophylaxis)	Mechanical prophylaxis - Chemical prophylaxis (e.g., low molecular weight heparin or direct oral anticoagulants)	Extended for 28 days postoperatively

Deep Vein Thrombosis (DVT) Prophylaxis

The ERAS guidelines for gynecologic oncology recommend DVT prophylaxis based on risk level (Fig. 4). Low-risk patients, such as those undergoing minimally invasive surgery, should receive mechanical prophylaxis until early mobilization. High-risk patients, including those with cancer, obesity, or undergoing laparotomy, require both mechanical and chemical prophylaxis, starting preoperatively and continuing postoperatively. For the highest-risk patients, extended chemical prophylaxis for up to 28 days is recommended, using low molecular weight heparin or direct oral anticoagulants (DOACs). Prophylaxis should be adjusted according to the patient's risk level (Table 2). [9,10]

Prevention of Surgical Site Infections

Surgical site infections (SSIs) are serious complications that increase postoperative morbidity and mortality. Prophylactic antibiotics, such as first-generation cephalosporins administered 15–60 minutes before incision, effectively reduce SSI risk in gynecologic oncology procedures. Skin preparation with chlorhexidine–alcohol is superior to povidone–iodine in decreasing bacterial load and preventing infection. Maintaining normothermia is also essential, as intraoperative hypothermia raises the risk of infection and cardiac events. Strategies such as forced-air warming and heated intravenous fluids are therefore integral components of the ERAS protocol. The ERAS guidelines recommend using chlorhexidine-alcohol for preoperative skin preparation, as it has been shown to reduce SSI rates by 40% compared to povidone-iodine. This method should be applied within one hour of incision, and its effectiveness is supported by evidence indicating a significant reduction in infection risk, with studies reporting a p-value of $p<0.001$. Proper skin preparation helps minimize bacterial flora at the incision site, significantly lowering the likelihood of postoperative infections.[9,10]

3.3. Critical Care and Postoperative Management

Postoperative Management in Gynecologic Oncology Patients

Postoperative management of gynecologic oncology patients requires a multidisciplinary approach to optimize recovery and prevent complications. Close monitoring of vital signs enables early detection of bleeding, infection, or thromboembolism, while multimodal pain control using oral and intravenous analgesics ensures adequate comfort. Maintaining fluid and electrolyte balance is also critical to avoid hypovolemia and related disturbances.[10]

Nutritional support plays a central role, with emphasis on protein-rich foods to promote healing; enteral or parenteral nutrition may be provided if oral intake is limited. Early mobilization is strongly

encouraged to reduce risks of deep vein thrombosis, pneumonia, and paralytic ileus. Proper wound care with aseptic dressing changes helps prevent infection, while prompt evaluation of redness, swelling, or discharge ensures timely treatment. Functional assessment of organs such as the bladder and intestines is also important to identify postoperative complications.[10]

Equally essential is psychosocial support, as patients often face significant emotional challenges after cancer surgery. Involvement of psychologists or counselors, along with strong family support, can improve adaptation and overall quality of life. Patient education on warning signs of complications and healthy lifestyle practices further enhance recovery.[10]

Patients with Comorbid Cardiovascular Diseases

The ERAS guidelines for gynecologic oncology stress the importance of managing patients with cardiovascular comorbidities due to their heightened risk of perioperative complications. Preoperative optimization involves controlling blood pressure, managing diabetes, and adjusting anticoagulant therapy to minimize cardiac risks. Anesthesiologists should be informed about the patient's cardiovascular status to tailor anesthetic care, potentially using goal-directed fluid therapy (GDFT) for hemodynamic stabilization.[9,10]

During surgery, continuous monitoring of heart rate, blood pressure, and oxygen saturation is crucial, with advanced tools considered for high-risk cases. Postoperatively, close monitoring for heart failure or arrhythmias is necessary, with cardiologists involved in care. [9,10]

ERAS protocols further enhance recovery by reducing complications for patients with cardiovascular comorbidities. Key strategies include pharmacologic prophylaxis with low molecular weight heparin (LMWH) to reduce venous thromboembolism (VTE), reducing DVT incidence from 8.3% to 2.4%.[13] Fluid management optimization decreases perioperative fluid administration from 15.8 mL/kg/hour to 11.5 mL/kg/hour ($p < 0.001$).[15] Early mobilization, with 92.7% of ERAS patients ambulating within 24 hours compared to 58.3% in conventional care ($p < 0.001$), significantly reduces DVT risk. [13] Postoperative monitoring ensures cardiovascular stability, with fewer severe complications in non-advanced cancer cases.[15]

Patients with Comorbid Endocrine Diseases

The ERAS guidelines for gynecologic oncology stress the importance of managing comorbid endocrine diseases in patients undergoing surgery. For diabetic patients, tight glycemic control through insulin therapy and carbohydrate loading is essential to prevent complications such as surgical site infections (SSIs), with studies showing significant reductions in SSIs when glycemic control is optimized. Thyroid management is also critical, ensuring stable thyroid hormone levels in hypothyroid patients and controlling hyperthyroidism to prevent complications like thyroid storm, particularly during high-risk surgeries.[9,10]

For patients with adrenal insufficiency, perioperative corticosteroid supplementation is recommended to prevent adrenal crisis, especially during extensive procedures such as debulking or HIPEC. The ERAS protocol further benefits patients with comorbid endocrine diseases, particularly diabetes, by improving recovery outcomes. ERAS patients experience significantly shorter hospital stays, with an average of 3 days compared to 5 days in conventional care ($p = 0.02$). Preoperative carbohydrate loading enhances glucose control and reduces hypoglycemia risks, supporting better postoperative recovery.

Early nutritional support, including high-carbohydrate drinks, improves glucose metabolism and accelerates healing, while ERAS patients show improved bowel function and reduced postoperative complications, including fewer infections. Postoperatively, tight monitoring of insulin therapy and glucose levels remains crucial to avoid hypo- or hyperglycemia.[16]

Patients with Comorbid Kidney Disease – Fluid and Electrolyte Imbalance

The ERAS guidelines for managing patients with comorbid kidney disease and fluid and electrolyte imbalances in gynecologic oncology focus on optimizing fluid balance and minimizing complications. For kidney disease patients, preoperative renal function assessment is crucial, particularly for those with chronic kidney disease (CKD) or on dialysis. Goal-directed fluid therapy (GDFT) helps prevent fluid overload and electrolyte imbalances, with studies showing a reduction in acute kidney injury (AKI) incidence (RR = 0.48, p = 0.03) and a 45% decrease in severe AKI through postoperative monitoring (OR = 0.55, p = 0.02). Additionally, glycemic control reduces infections and improves wound healing (p = 0.02), while renal dose adjustments for nephrotoxic drugs further decrease AKI (p = 0.01).[9,10] ERAS protocols also reduce hospital stays, with one study showing a reduction from 4.6 to 4.3 days (p = 0.026).[15]

For patients with fluid and electrolyte imbalances, preoperative GDFT is essential to prevent hypovolemia and fluid overload, with studies showing a reduction in complications (RR = 0.75, p < 0.05) and a 30% reduction in postoperative complications, including delayed bowel function and kidney dysfunction (OR = 0.7, p < 0.01). Tight postoperative monitoring of electrolyte levels and urine output is crucial, reducing complications like AKI and infections by 25% (p = 0.02).[9,10] ERAS also improves recovery by optimizing fluid management, with fluid volume administration reduced from 15.8 mL/kg/hour to 11.5 mL/kg/hour (p < 0.001) and shortening fasting times significantly (solid fasting time from 16 to 13.1 hours, fluid fasting time from 11 to 3.7 hours, p < 0.001).[15]

Patients with Ventilator Management

The ERAS guidelines for ventilator management in gynecologic oncology emphasize minimizing mechanical ventilation and promoting early extubation to reduce complications such as ventilator-associated pneumonia (VAP) and atelectasis. Early extubation, especially after major surgeries like debulking or extensive resections, is encouraged to minimize the risks associated with prolonged ventilation. Preoperative optimization of pulmonary function and prehabilitation helps minimize the need for extended ventilator support.[9,10]

For patients requiring postoperative ventilation, the focus is on short-term mechanical ventilation with early weaning as soon as clinically appropriate. Sedation and analgesia must be carefully managed to avoid over-sedation, which can delay extubation. Studies show that early extubation significantly reduces VAP and improves recovery, with a meta-analysis reporting improved length of stay and a reduced incidence of VAP (p<0.01).[9,10]

ERAS protocols optimize anesthesia, fluid balance, and early recovery. Controlled anesthesia during surgery ensures optimal ventilation and oxygenation, preventing complications. Fluid management is also critical, with studies showing a reduction in perioperative fluid volume from 15.8 mL/kg/hour to 11.5 mL/kg/hour (p < 0.001), and maintaining normothermia helps reduce hypothermia-related ventilation issues. Postoperatively, ERAS promotes early extubation and mobilization, minimizing

ventilator support time and accelerating recovery. Additionally, ERAS significantly reduces complications such as pulmonary infections and deep vein thrombosis (DVT), with infection rates dropping from 14.6% to 4.9% and DVT from 9.8% to 2.4%.[14,15]

Patients with Postoperative Nutritional Issues

The ERAS guidelines for postoperative nutritional management in gynecologic oncology emphasize early nutritional support to enhance recovery. Patients are encouraged to resume oral intake as soon as possible after surgery, starting with clear fluids and oral carbohydrates to reduce insulin resistance and improve well-being. Immunonutrition, including arginine, glutamine, and nucleotides, is recommended to support the immune system, reduce inflammation, and aid wound healing, with studies showing that arginine supplementation reduces infections and hospital stays (RR = 0.59, $p<0.05$). A high-protein diet (up to 2.0 g/kg/day) is essential to prevent muscle loss, improve wound healing, and promote faster recovery, with higher protein intake linked to quicker discharge. Postoperative electrolyte imbalances should also be monitored, with supplementation as needed.[9,10]

ERAS protocols emphasize early nutritional support to improve recovery outcomes, including preoperative nutritional screening and tailored plans to ensure patients maintain adequate nutritional status for optimal surgical tolerance. A high-carbohydrate drink is administered 2-3 hours before surgery to prevent energy depletion and hypoglycemia.[19,20] Postoperatively, patients receive early oral intake and protein supplementation, such as whey protein and nutritional drinks like Ensure, to promote wound healing, enhance immunity, and prevent infections.[16,19] Studies show that the ERAS group demonstrates significantly better nutritional recovery scores, with improved gastrointestinal recovery, faster bowel function return, and reduced complications. For example, patients on ERAS experienced a median time for the first flatus of 15.54 hours, compared to 21.24 hours in the conventional care group ($p < 0.001$).[15,16]

Patients with Postoperative Shock

In gynecologic oncology, particularly during debulking and extensive resections, postoperative hemorrhagic and septic shock are significant risks. The ERAS guidelines emphasize preventive measures to manage these complications effectively. For hemorrhagic shock, preoperative hemoglobin optimization, goal-directed fluid therapy, and hemodynamic monitoring are crucial to prevent blood loss-related shock, especially in high-risk patients (Fig. 5).[9,10]

For septic shock, the guidelines recommend perioperative glycemic control, antibiotic prophylaxis, and proper skin antisepsis, including chlorhexidine-alcohol for skin preparation. Avoiding nasogastric tubes and drains further reduces infection risks. Studies show that oral antibiotics before colorectal resections and glycemic control significantly lower postoperative infections and septic complications.[9,10]

4. Conclusion

Implementing a procedure-specific ERAS pathway—with early oral intake, multimodal opioid-sparing analgesia, standardized VTE and SSI prophylaxis, early mobilization, and normothermia—likely shortens LOS and reduces complications in gynecologic oncology. Future priorities include robust comparative studies in radical hysterectomy and cytoreductive surgery, and audits of implementation fidelity.

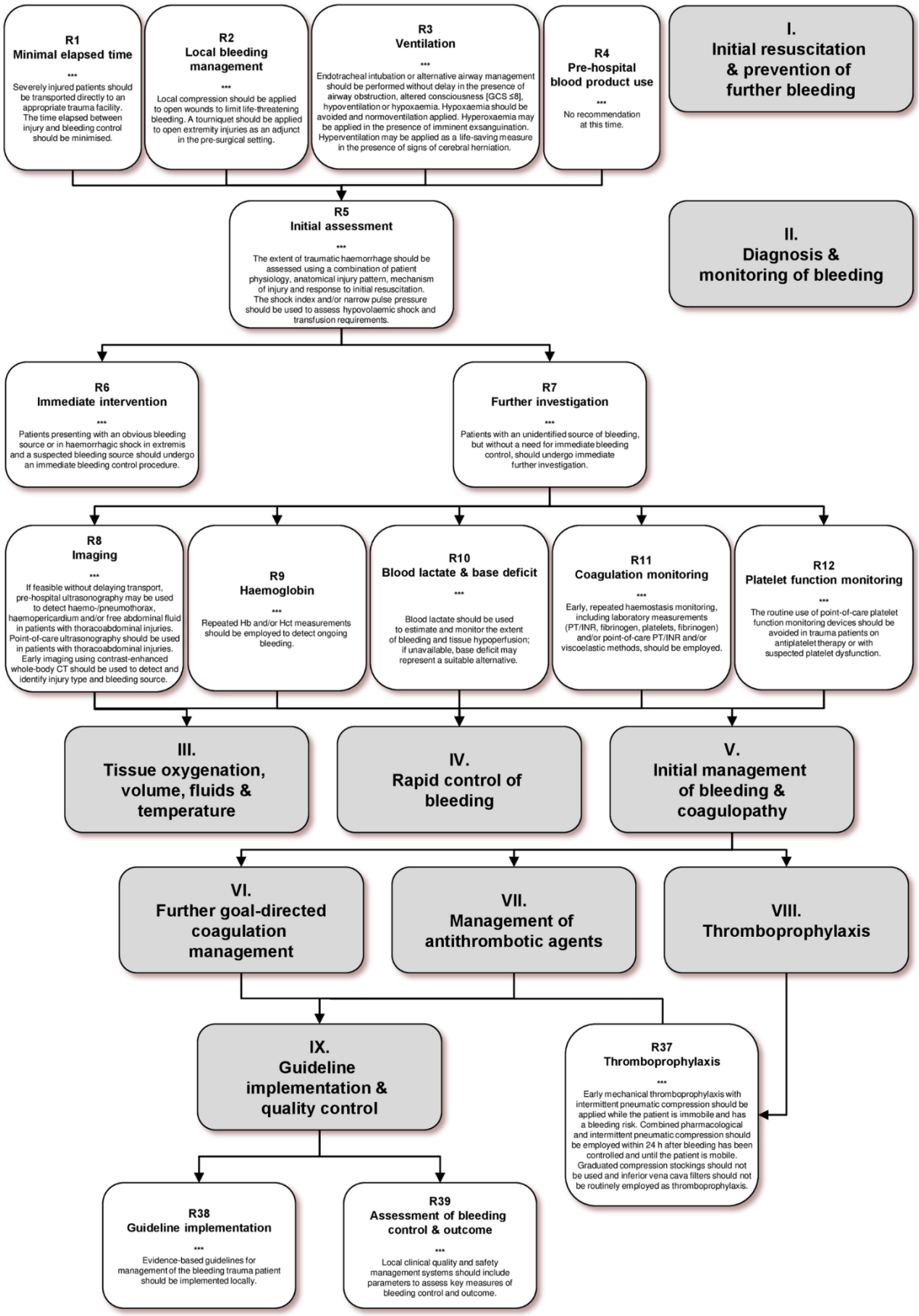

Figure 5. Algorithm and Strategy for Hemostatis[24]

References

1. WHO. *WHO Report on Cancer*. *IARC*. 2022.
2. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. *Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries*. CA *Cancer J Clin*. 2021 May;71(3):209–49.
3. Indriani R, Ritonga MA, Suardi D. *Evaluasi Tindakan Operatif pada Kanker Serviks , Endometrium dan Ovarium di RSUP Dr. Hasan Sadikin Bandung Tahun 2015–2016*. *Indonesian Journal of Obstetrics & Gynecology Science*. 2018;1(2):79–86.
4. Indrina JA, Indriasari I, Zulfariansyah A. *Angka Kejadian serta Karakteristik Mortalitas dan Morbiditas pada Pengelolaan Anestesi Perioperatif di RSUP Dr. Hasan Sadikin Bandung Tahun 2017–2019*. *Jurnal Anestesi Perioperatif*. 2022;10(1):35–49.
5. Krawczyk P, Lonc T, Świstek R, Tyszecki P, Andres J. *Anesthesia for gynecological cancer surgery*. *Folia Med Cracov*. 2022;62(3):19–42.
6. Shin W, Park SY, Kang S, Lim MC, Seo SS. *How to manage synchronous endometrial and ovarian cancer patients?*. *BMC Cancer*. 2021 Dec;21(1):1–8.
7. Silva Filho AL, Santiago AE, Derchain SFM, Carvalho JP. *Enhanced Recovery After Surgery (ERAS): New Concepts in the Perioperative Management of Gynecologic Surgery*. *Revista Brasileira de Ginecologia e Obstetrícia.*2018;40 (8), 433-436.
8. Carey ET, Moulder JK. *Perioperative Management and Implementation of Enhanced Recovery Programs in Gynecologic Surgery for Benign Indications*. *Obstetrics and gynecology*. 2018 Jul;132(1):137–46.
9. 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.
10. Nelson G, Bakkum-Gamez J, Kalogera E, Glaser G, Altman A, Meyer LA, et al. *Guidelines for perioperative care in gynecologic/oncology: Enhanced Recovery after Surgery (ERAS) Society recommendations - 2019 update*. *International Journal of Gynecological Cancer*. 2019;29(4):651–68.
11. Nelson G, Altman AD, Nick A, Meyer LA, Ramirez PT, Achtari C, et al. Guidelines for postoperative care in gynecologic/oncology surgery: Enhanced Recovery after Surgery (ERAS®) Society recommendations - Part II. *Gynecol Oncol*. 2016;140(2):323–32.
12. Parks L, Routt M, Villiers A De. *Enhanced Recovery After Surgery*. *J Adv Pract Oncol*. 2018;9(5):511–9.
13. Nuemanguli R, Jing D, JiangYing Y, Yu H. *Application of enhanced recovery after surgery in perioperative management of patients undergoing laparoscopic surgery for benign gynecological conditions*. *Medicine*. 2025;104(29):1–6.
14. Kim SR, Laframboise S, Nelson G, Mccluskey SA, Avery L, Kujbid N, et al. *Enhanced recovery after minimally invasive gynecologic oncology surgery to improve same day discharge : a quality improvement project*. *Int J Gynecol Cancer*. 2022;32(4):457–65.
15. Lindemann K, Kleppe A, Eyjólfsdóttir B, Danbolt SH, Wang YY, Heli- AG, et al. *Prospective evaluation of an enhanced recovery after surgery (ERAS) pathway in a Norwegian cohort of patients with suspected or advanced ovarian cancer*. *Int J Gynecol Cancer*. 2023;1279–86.
16. Li F, Zheng Y, Chen S, Wang Q, Wang K, Yang F, et al. *Role of transumbilical laparoendoscopic single-site surgery in the implementation ERAS in gynecology oncology : a retrospective study*. *Front Oncol*. 2025;(April):1–10.
17. Chen M, Song X, Chen LZ, Lin ZD, Zhang XL. *Comparing Mechanical Bowel Preparation With Both Oral and Systemic Antibiotics Versus Mechanical Bowel Preparation and Systemic Antibiotics Alone for the Prevention of Surgical Site Infection After Elective Colorectal Surgery: A Meta-*

Analysis of Randomized Controlled Clinical Trials. *Dis Colon Rectum*. 2016 Jan;59(1):70–8.

18. Koller SE, Bauer KW, Egleston BL, Smith R, Philp MM, Ross HM, et al. *Comparative Effectiveness and Risks of Bowel Preparation Before Elective Colorectal Surgery*. Ann Surg. 2018 Apr;267(4):734–42.
19. Radha M, Donimath K, Harshitha H, Kurdi M, Theerth K. *Outcomes of Enhanced Recovery After Surgery (ERAS) Protocol Implementation in Major Gynecologic Procedures : A Prospective Case- Control Study*. *Cureus*. 2025;17(5):6–13.
20. Yulan T, Qin X. *Perioperative nursing interventions based on the enhanced recovery after surgery concept for patients with gynecological malignancies*. *Medicine*. 2025;104(30):1–8.
21. Giesa N, Haufe S, Menk M, Piper SK, Balzer F, Boie SD. *Predicting postoperative delirium assessed by the Nursing Screening Delirium Scale in the recovery room for non-cardiac surgeries without craniotomy : A retrospective study using a machine learning approach*. *PLOS Digit Health*. 2024;3(8):1–21.
22. Harji DP, Griffiths B, Stocken D, Pearse R, Blazeby J, Brown JM. *Key interventions and outcomes in perioperative care pathways in emergency laparotomy: a systematic review*. *World J Emerg Surg*. 2025;20(1):20.
23. Nanavati N, Hoggett L, Hampton M, Gordon A. *Venous Thromboembolism After Orthopaedic Surgery – How Long Is The Patient At Risk ?*. *J Ageing Res Healthc*. 2018;1(2):12–20.
24. Rossaint R, Afshari A, Bouillon B, Cerny V, Cimpoesu D, Curry N, et al. *The European guideline on management of major bleeding and coagulopathy following trauma: sixth edition*. *Crit Care*. 2023;27(1):80.
25. Joshi TV, Bruce SF, Grim R, Buchanan T, Chatterjee-paer S, Burton ER, et al. *Gynecologic Oncology Reports Implementation of an enhanced recovery protocol in gynecologic oncology*. *Gynecol Oncol Rep*. 2021;36:100771.
26. Khudaer TS, Al-sarray AAM, Rasheed QA. *Postoperative Complications After Gynecological Surgry in Al Kut City*. *South East Eur J Public Health*. 2024;23:726–37.