Enhanced recovery after surgery in gynecologic oncology

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Abstract
Enhanced recovery protocols consist of a bundle of concepts including early feeding, opioid-sparing multimodal pain management, and euvolemia, with the overarching goal of hastening postoperative recovery. Enhanced recovery after surgery has been shown to reduce hospital length of stay, reduce costs, and decrease perioperative opioid requirements in benign and oncologic gynecologic surgery. Interventions without supporting evidence of benefit, such as the use of mechanical bowel preparation, routine use of nasogastric tubes and surgical drains, caloric restriction, routine use of intravenous opioid analgesics, and over-vigorous intravenous hydration should be discouraged to improve broader endpoints such as patient satisfaction and overall recovery. Successful implementation requires engagement from a multidisciplinary team including surgeons, anesthesiologists, nurses, and pharmacists.

KEYWORDS
Enhanced recovery after surgery; ERAS; Fast-track surgery; FIGO Cancer Report; Quality improvement

1 | INTRODUCTION

Surgery will always remain a form of intentional injury, resulting in collateral damage to normal tissues due to trauma-induced physiological changes mediated by cytokines, nitric oxide, and free oxygen radicals. However, multimodal interventions to combat the surgical stress response are thought to reduce the deleterious effects of surgical injury and lead to enhanced recovery, decreased morbidity, and reduced costs. Traditionally, patients were starved overnight, given opioid analgesia, nasogastric suction, and liberal use of intravenous fluids until flatus. To facilitate recovery, adoption of evidence-based, best perioperative practices is required. Elements of best practice include early feeding, avoidance of mechanical bowel preparation, utilization of preoperative patient education, optimization of comorbid conditions, euvolemia, normothermia, use of minimally invasive surgery, prevention of surgical site infection and venous thromboembolism, and assurance of optimal pain control while minimizing opioid use. Such perioperative optimization is known as fast track or enhanced recovery after surgery (ERAS), and was first used in colorectal surgery and later adapted to other surgical specialties.

The three main tenets of ERAS are early feeding, euvolemia, and multimodal pain control; these will be reviewed in the present article. While in recent years there has been rapid adoption of ERAS in many surgical specialties, change has been difficult in some groups because these tenets challenge traditional dogma. To achieve optimal results, a proactive, structured, and multidisciplinary process for ERAS implementation is needed. ERAS Society guidelines have been published for gynecologic oncology and should be considered standard of care.

2 | EARLY FEEDING

Patients with poor nutritional status should be rehabilitated prior to surgery. Patients who are nutritionally replete are allowed to eat solids until midnight and clear liquids until 2 hours before surgery. Carbohydrate loading is recommended the morning of surgery to prepare the body for the stress of surgery and minimize insulin...
resistance. In a systematic review of randomized controlled trials in patients with gynecologic cancer, early feeding resulted in shorter hospital stay and improved patient satisfaction. Patients should resume a regular diet 4–6 hours after surgery to maintain normal nutritional status and improve healing. Early feeding may result in a higher rate of nausea or even vomiting, which is generally self-limited and responds to antiemetics. This nausea is distinct from paralytic ileus and should not be treated as such. Although ERAS protocols do not increase the rate of paralytic ileus, if ileus does develop, this should be managed as standard by withholding food and using nasogastric suction.

Mechanical bowel preparation should be avoided. A recent meta-analysis showed that use of mechanical bowel preparation does not reduce the rate of anastomotic leak, surgical site infection, intraperitoneal fluid collections, reoperation, mortality, or interfere with visualization or bowel mobilization. On the contrary, mechanical preparations may cause dehydration and electrolyte and metabolic derangements. Retrospective studies have suggested, however, that nonabsorbable oral antibiotics, such as neomycin, may reduce the incidence of surgical site infections (RR 0.57; 95% CI 0.43–0.76) with no effect on organ space infections or anastomotic leaks, although most studies were performed in colorectal rather than gynecologic surgery. A meta-analysis of mechanical bowel preparation versus oral antibiotic plus mechanical bowel preparation showed that the combination was more effective in reducing total surgical site infections (16% vs 7.2%, P<0.001). A recent ACS-NSQIP study of over 40,000 patients undergoing colorectal surgery showed that oral antibiotics alone were as good as a combination of antibiotic and mechanical bowel preparation. The current practice at Mayo Clinic is to omit the use of any bowel preparation in favor of adopting measures specifically targeted to reduce surgical site infection and anastomotic leak. These measures can result in significant improvements in morbidity and do not require bowel preparation with its accompanying risks and patient dissatisfaction. Implementing a bundle of interventions (made up of 18 elements) can successfully reduce surgical site infection to very low rates without the use of bowel preparation.

3 | MULTIMODAL, OPIOID-SPARING PAIN CONTROL

Prior to induction of anesthesia, it is recommended that patients be given acetaminophen, celecoxib, and gabapentin. Infiltration of the wound with local anesthetic significantly reduces the need for opioids immediately after surgery. Patients should be provided with acetaminophen, ibuprofen, or ketorolac, and given limited doses of oral opioid if needed. Patients with persistent pain may receive opioids by intravenous push, with initiation of patient controlled analgesia only if more than two doses of intravenous opioid are necessary. In patients undergoing laparotomy for advanced ovarian cancer, less than 5% of patients at the Mayo Clinic require patient controlled analgesia using these guidelines as part of an enhanced recovery protocol. While epidurals may be used, less than 5% of patients at the Mayo Clinic receive an epidural; this is not a required element of ERAS protocols.

4 | EUVOLEMA

In guidelines published by the ERAS Society, maintenance of euvolemia in the perioperative period was recognized as a key factor in the reduction of morbidity and mortality associated with gynecologic oncology surgery. This was the result of investigations showing that while excess salt and fluid increases complications, very restrictive fluid regimens also fail to improve clinical outcomes. Fluid overload can lead to peripheral and small bowel edema, pulmonary congestion, and electrolyte abnormalities, and increases postoperative pain; whereas fluid restriction may decrease cardiac output and thus oxygen delivery to tissues, delaying healing and causing end organ dysfunction.

Rather than define optimal fluid balance quantitatively, clinically relevant goals apply. Replacing insensible losses, maintaining perfusion and blood pressure, allowing permissive oliguria (20 mL/h), and limiting boluses to 250 mL all factor into a reasonable approach to volume administration for patients undergoing gynecologic surgery. This not only makes allowances for the normal secretion of antidiuretic hormone with surgical stress, but also prevents extracellular fluid overload that may take weeks to eliminate.

Maintenance of euvolemia is a component of ERAS that can be difficult to execute given that fluid therapy is administered by multiple departments including anesthesia and surgery, and decisions regarding the administration of intravenous fluids are often made by the most junior members of the care team. Furthermore, the intraoperative time period is a critical time for volume administration. In one meta-analysis of nearly 1000 randomized patients, the effect of euvolemia was greatly reduced if fluid therapy was implemented postoperatively rather than intraoperatively. These findings urge multidisciplinary cooperation at initiation and maintenance of any ERAS program.

5 | IMPACT OF ERAS ON LENGTH OF STAY AND COST OF CARE WITH IMPLEMENTATION

Faster, more streamlined recovery of gynecologic oncology patients has been shown to lead to decreased length of stay and cost reductions, as has been demonstrated in colorectal surgery. At Mayo Clinic, ERAS afforded a 3-day reduction in median length of stay (from 8 to 5 days) for patients undergoing complex cytoreductive procedures (hysterectomy, lymphadenectomy, and omentectomy, as well as bowel resection, splenectomy, diaphragmatic resection, extensive cytoreduction, or all of these). The change was durable, with a similar length of stay reported 3 years later, and also included a 90% reduction in opioid requirements in the first 48 hours. Colorectal patients who underwent similarly complex procedures in hospitals throughout Alberta, Canada, also required two fewer days in the hospital on average (9.8 days pre-ERAS vs 7.5 days post-ERAS). This was accompanied by no change in 30-day readmission rates, readmission length of stay, or 30-day postoperative complications. In addition, patient
satisfaction remained high, with over 90% of patients rating care as excellent or very good regarding patient education, pain management, quality of care during hospitalization, and the discharge process.22

The reduction in cost of care with the implementation of ERAS has been impressive. Exploration of financial impact for colorectal patients in Canada revealed that for every US $1 invested in ERAS, US $3.8 was returned.23 This was consistent with 17 other studies, as examined in a health economics review of ERAS programs.30 Studies in gynecologic oncology have also shown reductions in cost. An early program incorporating some ERAS elements showed a US $5500 reduction in median 30-day postoperative hospital costs when compared with traditional management.31 In more recent investigations employing the entire ERAS spectrum, Kalogera et al.22 reported a 30-day cost of care savings of more than US $7600 per patient for complex cytoreductive cases, and a US $3000 per patient reduction for staging laparotomies (hysterectomy, lymphadenectomy, and omentectomy only). Modisitt et al.22 found a median cost reduction of almost US $2000 in their gynecologic oncology cohort. In our current healthcare climate, these benefits cannot be underestimated.

6 CONCLUSION

ERAS protocols combine evidence-based care components in the perioperative period enabling patients to recover more quickly and resume normal functions. This can be applied to the majority of patients undergoing gynecologic surgery. The successful implementation of an ERAS program requires the active participation of the patient and a multidisciplinary team effort.

AUTHOR CONTRIBUTIONS

SD created the concept for this chapter. GG, AP, and SD contributed to the writing. All authors edited and approved the final version of the manuscript.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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