

Research Article

Enhanced Recovery after Surgery in Obese Patients Undergoing Laparoscopic Hysterectomy for Benign Uterine Diseases

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Abstract

Abstract: Of the 500,000 hysterectomies performed annually in the USA, more than 80% are for the treatment of benign disease and over 50% are open procedures. Several recent studies have identified many of the key patient and provider determinants of the underutilization of minimally invasive surgery (MIS) by gynecologic surgeons. While both the American Congress of Obstetrics and Gynecology (ACOG) and the American Association of Gynecologic Laparoscopists (AAGL) recognize minimally invasive hysterectomy as the standard of care, the best approach to transforming this recommendation into practice remains unresolved.

Keywords: Implementation; Surgery; Laparoscopic

Introduction

Implementation of standardized care pathways centered around MIS, such as Enhanced Recovery After Surgery (ERAS) pathways, may be one particularly effective solution. ERAS pathways are multidisciplinary, multimodal, and evidence-based care protocols that are improving perioperative outcomes across a wide spectrum of surgical fields.^[1, 2]

ERAS pathways differ from fast-track surgery in that the key surgical endpoint is the quality, rather than the speed, of recovery^[3]. Specifically, the components of an ERAS pathway interact to minimize the neuroendocrine response to surgical insult (i.e. surgical stress response) which, in turn, translates into fewer postoperative complications, a decreased length of stay (LOS), and other adverse effects such as physical/cognitive decline. Various interdisciplinary care teams, including surgery, anesthesia, nursing, nutrition, pharmacy, and physical therapy, interface with the pathway making collaboration essential for success.

Colorectal surgery has seen the most substantial benefit from the greatest uptake of ERAS to date. Kehlet and his surgical team reported the first two series of patients managed according to an enhanced recovery scheme

shortly after the first cohort of 20 laparoscopic colectomies was published^[4-6]. Their fundamental enhanced recovery elements included epidural analgesia, early oral nutrition, mobilization, and laparoscopically assisted surgery. Thus, it is noteworthy that the first publication on enhanced recovery was combined with laparoscopy in an era when laparoscopic surgery was just emerging^[7]. Given that MIS has been one of the defining elements of ERAS from the outset and that MIS alone has led to substantial improvements in patient outcomes by decreasing intra-operative blood loss, complications, LOS, analgesic requirements, readmission rates, and time to resumption of normal daily activities, many have questioned the value of ERAS beyond MIS. Recently, the LAFA (laparoscopy and/or fast track multimodal management versus traditional care) trial prospectively evaluated patients requiring segmental colectomy for colon cancer. The study included four arms (laparoscopy/ERAS vs laparoscopy/traditional vs open/ERAS vs open/traditional). LOS was the primary outcome. Laparoscopy was the only significant independent factor to reduce LOS and morbidity^[8]. Other studies that have focused on laparoscopic colorectal surgery combined with an ERAS protocol have found that protocol compliance significantly impacts

complication rates and LOS, suggesting that there may be a synergistic benefit to combining MIS and ERAS^[9].

Data from other surgical subspecialties pertaining to ERAS in MIS patients are more limited as most investigations of ERAS programs have been performed in open surgery. This is the case with gynecologic surgery, and existing work in open surgery consists of observational studies with high risk of bias. The only existing systematic review and meta-analysis of ERAS in abdominal surgery for benign and malignant gynecologic conditions included 15 case series and 1 cohort study published between 1999 and 2014. The authors concluded that ERAS may reduce LOS in abdominal gynecologic surgery. More importantly, their analysis brought to light the huge variation in the number and combination of elements constituting ERAS pathways at different centers. This observation highlights the current lack of consensus on, and standardization of important pathway elements in gynecologic surgery^[10]. In order for ERAS to continue to evolve in gynecologic surgery, this must be addressed. The 2016 ERAS Society publication of guidelines for pathway implementation in major gynecologic surgery is a step in the right direction. Given that these were the most downloaded articles from the journal *Gynecologic Oncology* last year, there is a high level of interest in ERAS among the gynecologic surgical community. At this time, ERAS guidelines dedicated to MIS for benign and malignant gynecologic conditions do not exist.

ERAmiS for Gynecology to Date

The existing body of literature related to ERAS in minimally invasive gynecologic surgery is small. One retrospective cohort study evaluated whether an ERAS pathway facilitates early recovery and discharge in gynecologic oncology patients undergoing MIS. The authors concluded that in this patient population, ERAmiS is associated with significant improvements in recovery time, decreased pain despite reduced opioid use, and lower overall hospital costs (12% decrease)^[11]. This study, like others of similar design, has the major limitation of using historical controls as the comparator group and may have been confounded by a synchronous

quality improvement initiative to expedite hospital discharge. Another retrospective cohort study comprised of a mixed population of patients undergoing MIS on an ERAS pathway for benign and malignant gynecologic conditions (85% laparoscopic hysterectomy ± bilateral salpingo-oophorectomy, nodes, orcolpopexy) reported similar findings with respect to pain and cost savings (8% decrease)^[12]. More recently, Trowbridge and colleagues published a review of enhanced recovery programs in benign gynecology surgery^[13]. Studies pertaining to surgery performed in the outpatient setting were excluded. Nine studies were included in the analysis. However, three of the studies were limited to open hysterectomy and only half of the remaining provided sufficient documentation of a formalized ERAmiS pathway. Still, the data from these few studies have shown that the following ERAmiS interventions decrease LOS and improve patient satisfaction, pain, and nausea/vomiting scores: employing preoperative hydration, providing preoperative prophylaxis for postoperative nausea/vomiting (PONV), and using peri-operative multimodal analgesia including preemptive wound infiltration with local anesthetics^[14,15,16]. These elements, in addition to patient education and goal-directed fluid therapy to maintain euvolemia, should form the backbone of ERAmiS pathways.

Multimodal Pain Control

Utilization of multimodal pain interventions to reduce the reliance on opioid pain medications is a central feature of all ERAS programs. Opioids have a number of adverse effects that conflict with the ERAS mission including PONV, respiratory depression, delirium, hyperalgesia, bowel dysfunction, urinary retention, immunosuppression, and addiction even after short-term opioid use^[17]. We now know that 6 to 8% of opioid-naïve patients undergoing non-cancer procedures develop new persistent opioid use and that the risk is even higher after curative-intent cancer surgery. This vastly surpasses the 0.4% rate of new persistent opioid use in nonsurgical populations^[18,19]. The patient education component of the ERAS program calls upon surgeons and the perioperative care team to play a more active role in counseling patients on postoperative pain, potential risks of

opioids, and minimizing postoperative opioid use. Currently, there are no evidence-based guidelines to inform surgeons on appropriate opioid prescribing for the management of postsurgical pain.

Goal-Directed Fluid Therapy

Goal-directed fluid therapy (GDFT) is an important ERAS strategy for attenuating the surgical stress response by minimizing fluid and electrolyte imbalance. In combination with the maintenance of perioperative oral hydration and normothermia, GDFT aims to preserve normovolemia, cardiac output, and end-organ perfusion. Excessive administration of intravenous fluids is harmful. The increase in intravascular hydrostatic pressure that occurs with hypervolemia results in the release of atrial natriuretic peptides which damage the endothelial glycocalyx. The glycocalyx is a layer of membrane-bound proteoglycans and glycoproteins that coats healthy vascular endothelium. It plays an important role in managing vascular permeability by acting as a second barrier to extravasation. Thus, injury to the glycocalyx from fluid overload in the intravascular compartment results in extravasation into the interstitial space^[20]. Interstitial edema has multiple deleterious effects including respiratory compromise, gastrointestinal dysfunction, and impaired wound healing. The Brandstrup work shows that once a patient is 2 to 3 kg over their admission weight due to excess intravenous fluid administration, they face a significant increased risk of postoperative ileus, complications, and prolonged hospitalization^[21].

For most healthy patients undergoing minimally invasive surgery with marginal blood loss, minimizing excess fluid with a zero-balance approach will be sufficient. In all other cases, GDFT should be considered. GDFT requires hemodynamic monitoring to (1) determine whether fluid therapy is indicated and (2) measure the response to fluid challenge in real time. A recent survey of anesthesiologists from the ASA and the European Society of Anesthesiology (ESA) showed that decision-making about volume status and fluid therapy is largely based on individual practice patterns, blood pressure, central venous pressure (CVP), and urine output (UOP)^[49]. However, CVP monitoring

unreliably predicts volume responsiveness and UOP is a poor indicator of volume status^[22-25]. Oliguria (UOP < 0.5 mL/kg/h) commonly occurs in the postoperative period as a neurohormonal response to surgical stress unrelated to volume status^[24]. Stroke volume variation (SVV) and pulse pressure variation (PPV) are among the more reliable indicators of volume responsiveness^[23]. A dynamic variable threshold of 13% is generally accepted as the cutoff for GDFT.

Outcome Measures and Instruments for ERAmiS

While a diligent audit of the ERAS process and outcome measures are essential, those routinely selected for open abdominopelvic surgery are less likely applicable to MIS. To date, LOS as well as complication and readmission rates have been the main ERAS outcome measures for open abdominopelvic surgery. However, the majority of MIS patients are home within 23 h of surgery and have minimal risk for compromised recovery due to complications and readmissions. Sole focus on LOS, complications and readmission rates provides an incomplete understanding of the patient experience and functional recovery.

Conclusion

All surgeries, including MIS, are followed by a spectrum of impaired functional capacity and cognitive ability that extends beyond the immediate postoperative period. Enhanced recovery programs are principle-based, rather than ritual-based, perioperative care protocols designed to minimize surgical stress and its negative sequelae^[17]. Over the past decade, ERAS programs for open abdomino-pelvic surgery have been formalized. Their core components include patient education, pre-operative oral hydration and carbohydrate loading, multi-modal pain control, and goal-directed fluid therapy. Given that these interventions target the basic physiologic alterations that occur with elective surgery, their global impact is likely independent of surgical approach. However, a more nuanced understanding of the relative contributions of individual ERAS pathway components to recovery following open versus minimally invasive surgery is lacking. ERAS in major open abdomino-pelvic surgery has been shown to decrease complications, LOS, analgesic

requirements, and cost of care. Whether similar or other gains are possible with ERAS following gynecologic MIS remains to be seen. Certainly, the synthesis and standardization of a subspecialty-specific ERAmiS protocol must be the first step. Thereafter, work to-wards leveraging the protocol to improve MIS rates at the institutional level and beyond, to minimize postoperative opioid prescribing, and to proactively involve patients in managing their own recoveries, will follow. Institutions with a surgical enterprise committed to making value-based improvements in patient care that are driven by the scientific method, such as ERAS and ERAmiS, should set the new standards for surgical care.

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