

## Enhanced Recovery after Surgery (ERAS) for other Patients: A Summary of Evidence and Experience from Gynecologic Surgery

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The purpose of ERAS protocols is to utilize protocols and a multidisciplinary approach to perioperative patient care in order to increase patient satisfaction, facilitate recovery and decrease healthcare costs without additional risk to patients. Although there are many varying protocols in existence, basic components of ERAS protocols include: patient education; minimizing NPO and carbohydrate loading; eliminating bowel prep requirements; using minimally-invasive surgical techniques and fewer surgical drains; minimizing IV fluids intraoperatively; multimodal analgesia to minimize opioid use; aggressive PONV prophylaxis; early oral nutrition and assertive ambulation [1]. To date, the literature has not yet determined the relative weight of the individual components or how to choose individual components for specific patient populations.

The previous conventional thought was that the stress response due to surgery is inevitable and that prolonged rest for both the patient and the gastrointestinal tract was the best course of action [2]. Both of these conventions have been challenged. The recognized negative physiologic and catabolic effects occur primarily from inflammatory and neuro-humeral consequences of surgical stress [3]. We now recognize that a substantial element of the stress response can be avoided with current anesthetic/analgesic & metabolic support techniques. These effects are much more likely to occur and to have a more substantial impact when all of the elements described in typical ERAS protocols are incorporated together [1]. Further, it is clear now that medium-term functional decline will ensue if active steps are not taken to return the patient to full function as soon as possible [2]. It is important to note that even without clear evidence in the gynecologic literature, many of the elements of ERAS protocols can be implemented with very little cost [1].

Due to the leadership and interest by surgeons like Dr Henrik Kehlet and others, the field of general surgery has lead the way in the adoption of ERAS Programs for patients having elective colorectal surgery. These protocols and expanded collaborations are now beginning to move into other surgical domains. One of these areas is in gynecologic surgery. At the time of this writing, there are no Randomized Controlled Trials (RCT) in the gynecologic literature, but with the acceptance within colorectal surgery and the early evidence of ERAS protocols from the gynecologic literature, they are sure to follow. The following is a summary of some of the early findings from the gynecologic literature.

In 2006, Marx, *et al.* [4] compared retrospectively length of stay, recovery of GI function and the incidence of complications with 69 patients undergoing surgery for ovarian malignancy with 72 patients who previously underwent surgery utilizing conventional care. Notably, in the ERAS group, bowel preps were eliminated, thoracic epidurals were utilized routinely (instead of at the discretion of the anesthesiologist) for 72 hours, oral intake occurred 4 hours post-operatively and a standardized physical therapy program was initiated which included ambulation on the day of surgery. Findings in the ERAS group included: median defecation on POD 2; 60-85% patients with no nausea during the first week after surgery, 75-90% patients reports no pain or light pain only; median LOS was reduced to 5 days (versus 6 days.  $P < 0.05$ ) and a decrease in severe medical (not surgical) complication rate (2% vs 14%.  $P < 0.01$ ).

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Kalogera, *et al.* [5] performed a retrospective cohort study in 2013 of 241 patients dividing them into 3 patient cohorts and comparing length of stay. During the study, there were no significant changes in technique, technology, or surgical teams. Before their ERAS protocol, there was no standardization in the elements of patient care. The 3 cohorts were:

1. Surgical Staging Laparotomy for gynecologic malignancy.
2. Complex Cytoreductive Surgery (cohort 1 in addition to bowel resection, splenectomy, diaphragmatic resection, extensive cytoreduction or all of the above).
3. Vaginal Surgery including pelvic prolapse and vaginal hysterectomy.

Overall, they found a significant reduction in length of stay with similar readmission rates, significantly decreased IV PCA and opioid use (with similar pain scores), no reported complications from multimodal analgesia, no change in the rate of post-operative complications and significant cost savings. There was an increased incidence of nausea in the ERAS groups. 95% of patients rated their satisfaction with perioperative care as 'excellent' or 'very good'. Looking at the cohorts separately, it was clear that the greatest improvements occurred in the Complex Cytoreductive Surgery group. PCA use dropped from 98.7% to 33.3%, and opioid use in the first 48 hours was decreased by 80%. This group had a 1 day earlier return of bowel function and a 4 day reduction in length of stay. One third of patients were discharged home within 4 days (vs 6.4% in the Control group). There was no increase in the rate of surgical complications or severity of complications, and there was an 18% reduction in 30 day cost. This amounted to over \$7,600 per patient which led to a \$500,000 cost savings for this cohort of 81 patients.

The Surgical Staging Laparotomy cohort used PCA ten times less (8.3% vs 97.5%.  $P < 0.001$ ), but they experienced more nausea (33% vs 18.8% in the Control group). Length of stay was decreased by 2 days, and 26.2% (vs 5% in Control group.  $P < 0.001$ ) had a length of stay less than or equal to 3 days. The cost savings was greater than \$3,000 per patient which totaled (for 84 cohort patients) approximately \$252,000. Although the Vaginal Surgery ERAS group utilized PCA much less (9.2% vs 79.2), they had almost ten times more vomiting. This may be attributed to the greater use of spinal with intrathecal opioids (40.8% vs 10.4%) in the ERAS group. This may also explain the improvement in immediate post-operative pain scores in this group (from PACU through 4 hours after floor arrival). There was a significant increase in POD 1 discharge (46.1% vs 6.5%), however, there was no significant decrease in hospital costs in this cohort.

Two other studies with abdominal hysterectomy [6] and gynecologic malignancy [7] demonstrated the importance of having an active and organized approach to implementing an ERAS program with controls in place to ensure compliance. Both researchers describe that their institutions already had low length of stays because they already regularly followed many of the ERAS principals, however, by systematically embracing all of the elements of an ERAS protocol, they were able to realize additional cost savings as well as additional differences in length of stay. Despite recognized benefits to patients in general surgery within the same institution, it was demonstrated that these outcomes would not transfer to other surgical subspecialties without actively adhering to agreed-upon processes [7].

Interestingly, one author [6] indicated that the method of analgesia does not appear to affect patient outcome, though the reliance on opioids in their study was still high, and their rate of PONV was still significant. It is possible that the increase in nausea in many of these studies also has to do with earlier oral intake than conventionally taught. With a multimodal analgesia protocol which further minimized opioids and extended further into the post-operative course, it does not seem like a reach to believe that PONV would be reduced even if early oral intake has some bearing. Especially in a surgery like abdominal hysterectomy which amends itself so easily to continuous TAP blocks, this issue could easily be addressed. This may even contribute to further reductions in length of stay and overall costs.

There is a great amount of work still to be done in this area of research. Further data will continue to elucidate the relative importance of the various elements of ERAS protocols as well as which applications are best-suited to various surgical populations as our experience continues to expand within the overall system and protocols continue to evolve in individual institutions. Even if financial gains are modest as in the study by Yoong, *et al.* [8] with vaginal hysterectomies in a cohort of younger and healthier patients, as long as

complication rates do not rise, it is important to continue work with a multidisciplinary approach to develop these ERAS protocols for more and more surgical patient populations.

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