



ASCRS
American Society of
Colon and Rectal Surgeons

Quality Assessment and Safety Committee

Enhanced Recovery After Surgery (ERAS) Overview

Introduction

All parties – patients, payers, and providers are motivated (for different reasons) to optimize the speed and safety of patient recovery after abdominal surgery. The clinical and economic costs associated with delayed or sub-optimal recovery are staggering. Within the US, the costs associated with post-operative ileus alone are estimated at \$1.5 billion per year.¹ Clearly, strategies that target and enhance post-operative recovery are worth consideration.

History of ERAS

Significant improvements in recovery after major abdominal surgery can be achieved by implementing a standardized protocol of evidence-based treatments over the entire peri-operative period. First proposed by Professor Henrik Kehlet in 1994, this approach has come to be known as Enhanced Recovery After Surgery (ERAS)* by the Scandinavian collective that worked to implement Kehlet’s work at several different European centers. Adoption of these principles is growing across the US, with the intent of decreasing variability in practice, reducing morbidity, enhancing rates of recovery, and shortening post-operative length of stay. A growing body of evidence demonstrates that adherence to these principles can minimize morbidity and lower costs of surgery associated with a broad range of operations.

The portfolio of different elements of enhanced recovery can seem like a “shotgun” approach to optimizing recovery and improving quality of care. Each institution needs to go through its own process to select the elements that should be used within its own Enhanced Recovery Program (ERP). Not all elements are appropriate for all institutions, and within a single institution not all elements of an ERP are appropriate for all patients. With this review we hope to introduce a broad range of topics related to best perioperative care, and to direct the reader to resources for additional information.

Pre-operative Optimization & Counseling

Enhanced recovery principles include preadmission education/counseling to decrease anxiety, improve postoperative recovery, and facilitate hospital discharge. Preoperative education may include details about the procedure as well as patient responsibilities during the inpatient stay (e.g. use of incentive spirometer, advancement of diet, ambulation).

Optimization is also a key component of enhanced recovery. The goal of preoperative evaluation is to identify comorbidities and risk factors for complications as well as optimize any relevant conditions (e.g. blood sugar or blood pressure control, smoking cessation, avoidance of excess alcohol). There may also be a role for improving nutritional status or functional capacity (“prehabilitation”) in select groups of patients. Examples of tools for preoperative risk stratification include assessment of cardiac risk (e.g.

Lee Index), functional capacity (e.g. 6 minute walk test), and risk of acute kidney injury (e.g. General Surgery Acute Kidney Risk Index).

Nutrition

It is accepted that drinking clear liquids up to 2 hours prior to surgery is safe, and is endorsed by the American Society of Anesthesiologists.² The benefits of this practice include higher likelihood of a euvoletic volume status at time of surgery, decreased insulin resistance in the perioperative period, decrease in the catabolic state after surgery, and decreased levels of pro-inflammatory mediators. Some studies suggest a decrease in length of stay and overall complication rate. Additionally, there is compelling literature that liquids formulated with maltodextrin may be superior to other carbohydrates/sugars in promoting glucose control both intra-op and post-op and should be given prior to surgery.

Traditionally, enteral nutrition was withheld until the return of bowel function. With evidence-based perioperative nutritional support, the recommendation is to minimize postoperative fasting, with an accelerated return to full oral nutrition. Early feeding has been shown to decrease the risk of ileus, infection, and other complications without any associated increase in the risk of anastomotic leak, and also reduce lengths of stay.

Opioid-sparing multimodal Analgesia

Opioid pain medications act on the motility of the GI system, contributing to ileus and length of stay. A focus of enhanced recovery is on minimizing or entirely avoiding opioid narcotic usage. Toward this goal:

- Pre-/intra-operative use of transverse abdominis plane blocks, either bilateral or four-quadrant³
- Selective use of epidural catheters for perioperative pain control immediately prior to surgery and/or liberal use of long-lasting injectable anesthetics
- No or “low” opioid intraoperative technique (using ketamine, lidocaine, inhaled volatile agents or propofol)
- Post-operative use of NSAIDs (toradol, acetaminophen, ibuprofen, etc.) in addition to gabapentin or pregabalin (traditionally used for neuropathic pain). Of note, there is some controversy regarding the association between NSAID use and higher rates of anastomotic leak. Recent reviews/guidelines considered this risk low enough that these medications are acceptable given their known benefits.⁴⁻⁷
- Proactive use of anti-nausea medications
- Minimize post-operative opioid medication use

Goal-Directed Fluid Management

Fluid optimization is one of the protocol elements that crosses the preoperative (e.g. fluid and carbohydrate loading, no prolonged fasting), intraoperative (e.g. avoidance of salt and water overload), and postoperative (e.g. avoidance of salt and water overload, early oral nutrition) phases of care within ERAS pathways.⁸ Perioperative fluid management is a component of both the ERAS Society guidelines and consensus statement for anesthesia practice as well as the American Society for Enhanced Recovery (ASER) Guidelines.^{5, 6, 9-11} Key components of fluid optimization include use of balanced crystalloids (rather than 0.9% saline), perioperative near-zero fluid balance, and goal-directed fluid therapy.

Mobilization:

The length of time a patient remains in bed after surgery impacts the speed at which patients return to normal daily activities. All lines, tube, drains should be removed as promptly as possible. Patients who mobilize faster in their hospitalization have decreased inflammatory mediators and decreased length of

stay without any change in pain scores compared with patients who convalesce with less mobility. In addition, ambulation has been shown to speed up return of bowel function. Patients who will need specific rehabilitation services (physical or occupational therapy, or post-operative discharge to a rehabilitation facility) should be discussed and plans coordinated prior to surgery if possible.

Preventing Common Complications: Ileus and Infection

The cause of postoperative ileus is multifactorial. The elements of enhanced recovery minimize perioperative stress, inflammation, and fluid overload. Other elements of care that can reduce the likelihood of ileus include laparoscopic surgical approach, epidural catheters, opioid-sparing pain managements (e.g. use of acetaminophen and or NSAIDs, intravenous lidocaine), avoidance of nasogastric tubes, use of oral agents (e.g. chewing gum, magnesium, and alvimopan when using opioids), and an emphasis on both early feeding and early mobilization.

Alvimopan is an orally administered peripheral opioid antagonist that was approved by the Food and Drug Administration in 2008 to minimize problems with bowel function after large or small bowel surgery. Its efficacy is supported in multiple randomized trials.¹²⁻¹⁵ A lingering question exists as to whether or not Alvimopan adds additional benefit in the context of laparoscopic surgery and modern ERPs.¹⁶

Surgical site infection (SSI) is the most common complication after colorectal surgery. Processes that target reduction in SSI risk include preoperative antibiotic prophylaxis prior to skin incision and skin preparation with chlorhexidine-alcohol, preventing intraoperative hypothermia, and postoperative glucose control.

Getting Started

Several organizations are dedicated to promoting the principles of enhanced recovery and vetting/distributing information to interested providers. The American Society for Enhanced Recovery (ASER) and the ERAS Society are two of the most prominent. A significant amount of materials and programmatic support are available through these sites, as well as others.

Any provider interested in starting an ERP should consider mechanisms by which to monitor adherence to specific processes, as well as outcomes/events. There is no perfect way to do this, but there is help available. The ACS-NSQIP has a program - Enhanced Recovery in NSQIP (ERIN) – that guides and monitors the implementation of an ERP. This module contains a relatively limited number of additional variables and acts as an excellent supplement to the NSQIP colectomy and proctectomy-targeted datasets. Through the ERAS Society, institutions can participate by sharing data regarding their ERP, and in return receive regular feedback/metrics. Either of these approaches (ERIN, ERAS society) has costs, however, in terms of participation fees and personnel costs.

* Of note, the term ERAS is now a trademark registered to the ERAS Society. {, #333}

Selected Resources

- 1) [ERAS Society](#)
 - a. [ERAS Society Guidelines](#).
- 2) [SAGES](#)
 - a. [SMART® Enhanced Recovery Program](#)
- 3) [American Society of Enhanced Recovery \(ASER\)](#)
 - a. [ASER Protocols](#)

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