

Review Article

Implementing enhanced recovery pathways to improve surgical outcomes

Shilpadevi Patil, Elyse M. Cornett, June Jesunathadas, Kumar Belani¹, Charles J. Fox, Alan David Kaye², Lee A. Lambert², Richard D. Urman³

Department of Anesthesiology, LSU Health Shreveport, Shreveport, ²Department of Anesthesiology, LSU Health Sciences Center, New Orleans, LA, ¹Department of Anesthesiology, University of Minnesota, Minneapolis, MN, ³Department of Anesthesiology, Perioperative and Pain Medicine, Harvard Medical School, Brigham and Women's Hospital, Boston, MA, USA

Abstract

An enhanced recovery pathway is a structured perioperative healthcare program that incorporates evidence-based interventions including protocols and guidelines with the aim of providing standardized care. Enhanced recovery pathways can help maintain operating room safety and efficiency, improve postoperative recovery and a variety of important patient outcomes, and reduce overall costs of patient care following major surgery. Postoperative complications are minimized, which, in part, are attributed to adjustments in fasting and postoperative nutrition, interventions aimed at improving early mobilization, and careful selection of pharmacological agents for anesthesia and analgesia. Major surgery can lead to a variety of physiological stressors including organ dysfunction, and hormonal and neurological disturbances. The current notion of fast-tracking (bypassing phase I recovery level of care) differs from enhanced recovery pathways as the principles of enhanced recovery pathways are often applied to inpatient and complex procedures and span the entire spectrum of patient care. Also, enhanced recovery pathways programs are being used for pediatric patients especially with the hope of minimizing opioid exposure and the quality of recovery. A PubMed literature search was performed for articles that included the terms enhanced recovery pathways to improve surgical outcomes. In this article, we summarized the clinical application of enhanced recovery pathways and highlighted the key elements that characterize implementing an enhanced recovery pathway in surgery.

Keywords: Enhanced care, enhanced recovery pathway, intraoperative care, perioperative care, preoperative care, protocols, surgery

Introduction

The concept of enhanced recovery after surgery (ERAS)[®] was started nearly two decades ago by the European healthcare providers.^[1] With the development of regional anesthesia techniques in the 1990s, major changes occurred in the field of anesthesiology to control pain. Simultaneously in the field of

surgery, the use of minimally invasive laparoscopic techniques became widely adopted for many surgical procedures. As a result there was a significant improvement in postoperative recovery and an earlier return of patients to normal function termed “fast-track.” However, at least some of the improvements seen were due to significant changes in perioperative care attitudes.

Professor Henrik Kehlet further developed this “fast-track” concept for major abdominal surgery. A median postoperative hospital stay of 2 days in open colectomy patients was achieved when the patients were treated in a fast-track surgery program,

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Address for correspondence: Dr. Elyse M. Cornett, Department of Anesthesiology, LSU Health Shreveport, 1501 Kings Highway, Shreveport, LA 71103, USA. E-mail: ecorne@lsuhsc.edu

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compared with the standard hospital stay of 5–10 days at the time.^[1]

Traditional perioperative care principles comprised of prolonged fasting, extended periods of bed rest, use of bowel preparations, and insertion of drains, which were eventually shown to be unnecessary and contributed to postoperative functional deterioration. Major surgery can lead to a variety of physiological stressors including organ dysfunction, and hormonal and neurological disturbances. This is manifested in a patient with signs and symptoms of pain, nausea, insomnia, constipation and fatigue. Henrik Kehlet combined several interventions that directly targeted reducing surgical stress. These interventions included the avoidance of fasting, bowel preparations, and drains, and the inclusion of carbohydrate fluids before surgery, regional anesthetic and opioid sparing techniques, active patient mobilization, earlier enteral intake, and pre-emptive treatment of postoperative pain and nausea. Several other groups have since employed similar techniques, demonstrating reductions in length of hospital stay, fatigue, and morbidity.

Although originally piloted by providers in Denmark for patients undergoing colorectal surgery, the principles are currently being applied to other surgical programs, such as gynecologic, orthopedic, thoracic, genitourinary, and some pediatric surgeries. The following strategies were identified as interventions that reduce the physiological stress response to surgery. The theoretical basis of these strategies is that the reduction in the stress response can result in shorter length of hospital stay and fewer postoperative complications Table 1.

Why Use Enhanced Recovery after Surgery

The advantage in using ERAS versus conventional perioperative management is that ERAS programs can help improve healthcare value in an environment of rising healthcare costs in the United States.^[2-4] It is well documented that the implementation of ERAS in the United States has resulted in a decrease in the time patients' stay in the hospital. This reduction has had a significant impact on the total cost of acute care for hospital stays following surgeries. For example, a recent study compared the cost of conventional perioperative care versus that of the ERAS protocol in patients who underwent minimally invasive spinal surgery and found an average a cost savings of \$3,444 per patient, which equated to a greater than 15% cost savings per patient. The demonstrated reduction in length of patient hospital stay associated with ERAS has raised concerns about the possibility of a rise in emergency room visits and readmissions. However, in a study of 2,876 patients who participated in the ERAS protocol after

Table 1: Enhanced recovery after surgery simplified

Prehospital

Preoperative assessment in a dedicated outpatient session. Program information is given to the patient, including specific daily milestones. Social issues are identified and addressed. Preoperative ward visit and orientation are completed

Preoperative

Early identification and optimization of medical comorbidities, smoking cessation, improvement in nutritional status, prehabilitation for ideal physical fitness, preadmission education including expectations for postoperative care and recovery, reduce preoperative anxiety of patient and family, prepare patient with realistic expectations, adherence to current practice guidelines for fasting (minimization of prolonged fasting), clear fluid and carbohydrate-rich drink loading hours before surgery, omission of selective bowel preparation (no routine bowel cleansing procedures) appropriate antibiotic prophylaxis, appropriate thromboprophylaxis are addressed

Intraoperative

These key aspects of the ERAS protocols are specific to intraoperative patient care including use of short-acting anesthetic agents and support rapid emergence and recovery, opioid-sparing pain management, multimodal techniques to include preemptive regional anesthesia/analgesia, avoidance of postoperative drains and nasogastric tubes help minimize discomfort and support early mobilization, judicious management of intraoperative fluid replacement, maintenance of normothermia (body warmer/warm intravenous fluids)

Postoperative

These key aspects of the ERAS protocols are specific to postoperative patient care. Implementation of multimodal opioid-sparing analgesia to avoid delayed gut function, midthoracic epidural anesthesia/analgesia, prevention of nausea and vomiting, early oral nutrition as tolerated, stimulation of gut motility, restricted amounts of intravenous fluids, early mobilization, early removal of urinary catheter

Postdischarge

The patient is given a phone number for contacting the ward if required. Nursing staff contacts the patients 3 days after discharge for a phone interview. Follow-up outpatient clinic appointment within 7 days of discharge

Continued quality improvement

The key is to become familiar with the common principles and evidence-based guidelines that are the foundation of ERAS. Successful implementation of ERAS programs requires active participation in multidisciplinary teams and opportunities for nurses to advocate on behalf of patients for optimal care. The willingness to learn and apply new healthcare principles that are seemingly nontraditional is crucial to achieve a practice environment conducive to appreciating the benefits of the ERAS philosophy of practice

Strategies are based on current experience and evidence-based guidelines.

A thriving ERAS practice includes a commitment by all members of the surgical care team, including the anesthesia provider, surgeon, the patient, and all other staff responsible for participation in the ERAS program. ERAS=Enhanced recovery after surgery

elective colorectal surgery at 15 different academic hospitals, a length of stay fewer than 5 days did not result in an increase in emergency room visits or readmissions.^[5]

The ERAS protocol encourages prescribing opioids sparingly and uses a multimodal anesthesia care approach, such as regional anesthesia, local anesthetics, or nonopioids such as

gabapentin, ketamine, and nonsteroidal anti-inflammatory drugs (NSAIDs).^[6] As such, the benefits of implementing an ERAS protocol in hospitals may also help alleviate the opioid crisis by decreasing the risk of patients becoming addicted to opioids.^[7,8] In a study by Cogan *et al.*, the authors reported a significant decrease in the need for opioids after surgery when an intraoperative intra-articular injection of morphine and clonidine was used.^[9] In another study conducted in renal transplant patients, patient-controlled analgesia morphine requirements were significantly reduced after surgery in the ERAS group versus the non-ERAS group.^[10] Despite limiting opioid usage preoperatively and decreased pain scores and the need for opioids after surgery, the culture of prescribing pain medications postoperatively after discharge has remained unchanged.^[11] The reason for this may be that the prescribing practices for opioids after surgery are deeply entrenched and not as easily changed as perioperative care practices. Only when physician prescribing practices change will there be a larger positive shift in the decrease of opioid use in the operating room.

Who Should Receive Enhanced Recovery after Surgery

There are ongoing studies on the impact of ERAS on patient outcomes and it appears that essentially any surgical specialty should be amenable to an ERAS pathway. Although most of the evidence for ERAS thus far is in adult surgeries, some programs are beginning to use ERAS in pediatric surgery.^[12] In fact, the development and evaluation of pediatric-specific enhance recovery protocols among a multidisciplinary expert panelists has been recently investigated.^[13] As pediatric protocols develop, ERAS has the potential to extend to patient populations of various age groups. Thus, it is likely that as more evidence-based studies that elucidate the benefits of ERAS continue to be published in adult and pediatric populations, ERAS will continue to evolve and gain popularity.

ERAS should continue to be used as long as patient safety continues to be prioritized and postoperative complications continue to be minimized.

Patients may feel alarmed about the fact that they are sent home from the hospital after only a few days post surgery, as this is a shift from the traditional long hospitalization after surgery. However, with proper education and ensuring all patient care needs are met, recovery at home is preferred. At home, recovery is optimized because patients are familiar with the surroundings, which promotes a less stressful and less traumatic recovery. Recovery outside the hospital also allows for optimized rest and an environment more conducive to sleep with fewer nursing and staff interruptions.

Enhanced Recovery after Surgery Pathway Development

Project vision and strategy

ERAS is a collaborative approach to bring the departments of anesthesia and surgery together to improve perioperative care and outcomes. As the popularity and implementation of the ERAS program continues to grow, there will be continuous changes in the roles of the healthcare team. For example, anesthesiologists will need to extend their care beyond just delivering safe anesthetics, they will need to apply modern evidence-based practices to maintain quality perioperative care to help improve patient outcomes.^[14]

Strategies to successfully implement ERAS include ensuring patients are engaged, physicians embrace the change, support staff fully vest into the program, and executive leaders allow for the appropriate foundation for ERAS execution.^[15] In the next decade as ERAS protocols gain appeal as a means to reduce health care cost, it is expected that findings from primary research projects focused on ERAS protocols will spur the development of new ERAS guidelines.

Change management

ERAS pathway management consists of evidence-based guidelines that serve to improve postsurgical pain, improve gastrointestinal motility, encourage early ambulation, and impose limits on surgical drains and multimodal pain modalities to improve postoperative outcomes. Recommendations include providing prophylaxis against thromboembolism and minimizing fluid administration. Postoperative glucose control is optimized by the perioperative maintenance of blood glucose levels. Furthermore, ERAS protocols usually recommend removal of urinary catheters and encourage early ambulation with mobilization within 24 hours. There are also recommendations to maintain a homeostatic state by controlling metabolism, ensuring fluid balance, and supporting the body return to key functions after surgery.^[16] In a recent patient-driven study of 27 patients, patients believed that ERAS should begin from diagnosis to recovery versus from the perioperative period to recovery.^[17] By educating patients about ERAS early in the time course of their care, patients have greater opportunity to gain access to education material related to their surgery and recovery, which may help improve their entire perioperative care through recovery.

Enhanced Recovery after Surgery Team

The ERAS team encompasses a wide range of hospital staff. But regardless of the members involved, ERAS promotes a team approach to patient care. One of the goals of the team-

based approach is to ensure realistic expectations for the patient regarding anesthesia, surgery, and most importantly, the recovery process. The team extends beyond the conventional surgical team, which historically included surgeons, anesthesiologists, nurses, and perioperative staff and now incorporates pharmacists, physical therapists, occupational therapists, dieticians, health educators, program managers, patient care coordinators, a pain management team, emergency medicine personnel, and most notably the patient.^[15] Coordinating the efforts of the ERAS team is the ERAS program facilitator. The ERAS facilitator will likely provide guidance, deliver memos and emails, implement rules and regulations, manage the logistics of the perioperative team, and train new personnel.^[16] The ERAS facilitator at any institution can be a physician, a midlevel provider, an administrator or a nurse. This person is crucial to the success of ERAS implementation.

Anesthesiologists have a very important role in the interdisciplinary approach of ERAS implementation, notably by applying multimodal anesthetic modalities for adequate pain control.^[18] Nonopioid analgesics mentioned previously include non-steroidal anti-inflammatory drugs (NSAIDs), acetaminophen, N-methyl-D-aspartate receptor (NMDA) receptor blockers, neuraxial blocks, intravenous lidocaine infusions, alpha-2 receptor agonists, and transverse abdominis plane (TAP) blocks. NSAIDs have anti-inflammatory and analgesic properties, which, when used in combination with acetaminophen in an acute setting, have been shown to produce similar analgesic effects as opioids.^[19] The various routes of administration of acetaminophen (PO, IV, rectal) also allows for administration in a variety of patients and conditions, which may further help reduce usage of opioids. Furthermore, IV acetaminophen may reduce hepatic exposure by avoiding first pass metabolism. NMDA receptor antagonists, such as ketamine, are another good alternative to opioids as it has both sedative and analgesic properties. Alpha 2 agonists, such as clonidine, and dexmedetomidine may also be used as they do not suppress respiration to the extent that opioids do. Finally, TAP blocks are a technique where a local anesthetic is used between the plane of the internal oblique and transversus abdominis muscle. Recent studies have reported that the use of TAP blocks has provided pain attenuation for more than 24 hours, reducing the need for opioids.^[20,21] In addition, when liposomal bupivacaine is used, the duration of the block is enhanced.^[22]

Modern medicine is moving toward more specialized and targeted patient care. Therefore, an important contributing key member of the entire ERAS team is the patient. Ensuring patient-centeredness and engaging the patient to participate in their recovery is vital to success. Providing patients with expectations, roles, and responsibilities will not only help ease their anxiety but will empower them to be an active member of their recovery.^[15]

Implementation of Enhanced Recovery after Surgery

The ERAS Implementation Program (EIP) is developed to help perioperative care teams to implement the ERAS programs. The main focus is to build functional teams around the surgical care teams. The program provides these teams resources to monitor and analyze the changes once an ERAS program is developed. The program runs for 8–10 months with four workshops. The initial workshop provides introductions to ERAS and strategies for implementation. The second workshop details local site goals, whereas the third measures anticipated outcomes of ERAS and develops plans for local implementation. The fourth workshop develops tools for reporting results and summary of experiences and concludes with developing a future plan.

However, it should be noted that the implementation of ERAS practices has not been as rapid as expected across the United States and this is likely due to its newness and concern for liability. However, with the shift in reimbursements for services to a bundle payment system, modifications in the delivery of perioperative surgical care will need to meet the demands of optimizing patient care in an environment of limited reimbursements.^[23,24]

Conclusions

ERAS is a shift in traditional perioperative care to a multimodal, multidisciplinary approach that aimed to improve clinical outcomes by decreasing recovery time, reducing hospital stay, and shortening procedural time. ERAS is helping to move patient care forward, while decreasing costs and enhancing the patient experience. The key to implementation of ERAS is recognition of the team effort toward mutual goals, and enhancing patient outcomes postoperatively.

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Conflicts of interest

There are no conflicts of interest.

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