Applying Enhanced Recovery Pathways to Unique Patient Populations

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Abstract

Keywords

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Enhanced Recovery after Surgery (ERAS) pathways have become popular in colorectal surgery due to their associated decrease in length of stay (LOS), complications, and readmission rate. However, it is unclear if these pathways are safe, feasible, or effective in unique patient populations such as elderly patients, urgent/emergent surgeries, patients with specific comorbidities, inflammatory bowel disease, or pediatric patients. Enhanced recovery pathways appear safe in elderly patients, associated with decreased complications, though with slightly lower rates of adherence and increased LOS and readmission rates. Modified ERAS pathways have been applied to urgent and emergent surgeries, resulting in decreased morbidity and LOS. There have been no studies that performed subgroup analyses of ERAS pathways in patients with specific comorbidities. Studies investigating patients with inflammatory bowel disease on enhanced recovery pathways are extremely limited, but suggest that they are safe and feasible. Data on ERAS pathways in pediatric patients are still emerging. Therefore, though data are sparse, enhanced recovery pathways appear to be safe in unique patient populations, with similar efficacy in decreasing LOS and complications. There is an urgent need for more studies investigating these specific patient groups to aid perioperative decision making by colorectal surgeons.

The Enhanced Recovery after Surgery (ERAS) protocol is a multimodal, multidisciplinary approach to the perioperative care of the surgical patient, which standardizes evidence-based best practices into a streamlined pathway. ERAS incorporates elements including early nutrition, early mobilization, prevention of ileus, early removal of drains and catheters, and goal-directed fluid therapy. First introduced in the 1990s, it has become widely popular among multiple surgical specialties, particularly colorectal surgery, where data have demonstrated decreased length of hospital stay, complications, readmissions, and cost.¹ In fact, large meta-analyses have demonstrated a reduction in complication rates by up to 50% when ERAS components are implemented in colorectal surgery.^{2,3} Further studies have demonstrated an even larger beneficial effect in patients who are compliant with more aspects of the pathway.^{4,5} However, some clinicians apply the ERAS pathway only to young, healthy patients, because of

concern that older patients with significant comorbidities may not tolerate the expedited protocol. This raises the question of whether the ERAS pathway can be administered in all patient populations and clinical situations. This review examines the safety and efficacy of the ERAS protocol in elderly patients, patients with specific comorbidities, patients undergoing emergent and urgent surgery, patients with inflammatory bowel disease (IBD), and pediatric patients.

Elderly Patients

Early adopters of the ERAS pathway initially did not apply the protocol to geriatric patients, due to concern that it was too aggressive for older, more debilitated patients. In fact, one study of 852 patients on an expedited pathway found that a higher Modified Frailty Index was associated with “failing” early discharge, meaning that frail patients were more likely

to have a length of stay greater than 3 days.⁶ Yet some elements of these pathways lend themselves to the care of elderly, comorbid patients, such as epidural analgesia and minimization of narcotics to prevent postoperative ileus and delirium. The change in mindset from a singular focus on early discharge to using ERAS protocols to achieve an overall “enhanced recovery” has encouraged more providers to apply components of the pathway to elderly patients.

Multiple studies have now been published establishing the safety and similar efficacy of using the ERAS pathway in older patient populations. Bagnall et al performed a systematic review of 16 studies involving 5,965 patients who underwent colorectal resection.⁷ Two of these studies were randomized controlled trials that compared elderly patients who were on the ERAS pathway to elderly patients who were not, and demonstrated shorter hospital stay and fewer complications for the older patients who were on the ERAS pathway. The observational studies that they reviewed found no large difference in morbidity and mortality between younger and older patients on the ERAS pathway, though older patients tended to have longer length of stay.

A notable limitation of these studies was that they did not examine patient adherence to the ERAS pathway. When examining compliance of elderly patients with elements of the pathway, the data become more mixed. Feroci et al found that, among 606 patients undergoing colorectal surgery, male gender, older than 75 years, and American Society of Anesthesiologists (ASA) classes 3 and 4 were associated with noncompliance with pathway elements, including bladder catheter removal, diet advancement, and early mobilization.⁸ They also found that lower adherence to the ERAS pathway was associated with higher morbidity and mortality and longer length of stay in patients older than 75 years. However, a retrospective analysis of 513 patients by Slieker et al compared patients <70 and ≥70 years old and found that, though older patients had significantly more comorbidities and were more likely to be undergoing urgent surgery, they had equivalent compliance with the preoperative, intraoperative, and postoperative components of the pathway.⁹ Overall adherence with the pathway was 78% in younger patients and 74% in older patients ($p = 0.86$). Older patients were more likely to have delayed bladder catheter removal and increased use of postoperative nasogastric tubes, but there was no difference in morbidity or mortality. Another study reported more modest results; among 188 patients older than 70 years undergoing colorectal resection, there was an overall compliance rate of 56%, with the most successful interventions being early mobilization and early oral intake.¹⁰ Of some concern, a study by Baek et al of 337 patients found that, though there was no difference among younger versus older patients in return of bowel function, advancement of diet, removal of bladder catheter, complications, and length of stay, there were increased rates of emergency room visits and readmission within a month after discharge in older patients.¹¹

Therefore, though the data are mixed, the ERAS pathway appears to be safe in elderly patients, though with slightly lower rates of adherence to aspects of the protocol and with

increased length of stay and readmission rates. These results suggest that elderly patients may benefit from slight adjustments to the protocol, as well as a change in the perception of the pathway as being more than just a “fast-track” to discharge. It is clear that elderly patients benefit from some elements of the pathway, and that differences in outcomes compared with young patients are likely related to their comorbidities and baseline functional status, not due to being too aggressively managed on an ERAS pathway.

Patients with Specific Comorbidities

Most studies that examine the feasibility and efficacy of the enhanced recovery pathway in elderly patients mention that the degree of comorbidity is often correlated with age. However, while markers of overall comorbidity such as the Charlson Comorbidity Index and American Society of Anesthesiologists classification are significant predictors of patients' ability to adhere to pathway components, length of stay, and postoperative complications,¹² it would be helpful for clinicians to know if particular conditions have more of an effect than others. For example, chronic renal failure, cirrhosis, anticoagulation or antiplatelet therapy, depressed ejection fraction, emphysema on home supplemental oxygen, or diabetes on insulin may contribute more than other conditions to pathway compliance, morbidity, and mortality. A review of the current literature identified no studies that performed subgroup analyses of the ERAS pathway in patients with specific comorbidities. There is a clear need for such data to aid perioperative decision making by colorectal surgeons.

Patients Undergoing Emergent and Urgent Surgery

The ERAS pathway has been well studied in patients undergoing elective colorectal resections, but there are less data regarding patients undergoing urgent or emergent surgery. Though some of the preoperative elements such as preoperative carbohydrate loading are not possible in the setting of an urgent procedure, other components of the pathway are still feasible and likely lead to improved patient outcomes. Shida et al evaluated 122 patients with obstructing colorectal cancer, comparing standard of care with a modified ERAS pathway incorporating intensive preoperative counseling, careful fluid management, early oral nutrition, intraoperative body temperature control, early mobilization, stimulation of gut motility, and early bladder catheter removal.¹³ They excluded patients with rupture or impending rupture, or those who received only a colostomy. ERAS patients had a significantly shorter length of stay, and there was no difference in morbidity, mortality, or readmission rate.

In fact, the ERAS program has been found to be beneficial in patients undergoing emergent major abdominal surgery. A study of 370 patients found that, after the implementation of ERAS, patients received significantly less intraoperative and postoperative intravenous fluid, urinary catheters and drains were removed earlier, and patients were transitioned to oral analgesia earlier.¹⁴ ERAS patients had fewer major

complications such as pneumonia, urinary tract infections, and urinary retention, demonstrating that application of expedited recovery techniques to patients with acute surgical problems is safe and feasible. Perhaps even more promising, a small study from South Africa of 38 patients who presented with penetrating abdominal trauma and underwent exploratory laparotomy found that ERAS patients had faster diet advancement, earlier urinary catheter removal, and earlier nasogastric tube removal, with a decreased length of stay and no difference in complication rate.¹⁵

Therefore, though many studies have found that strict adherence to the ERAS protocol is closely tied to the degree of outcome improvement,^{5,16} these data suggest that even application of a modified ERAS pathway in the urgent or emergent setting is safe and effective.

Patients with Inflammatory Bowel Disease

Surprisingly, there has been very little data published about the utility of the ERAS pathway in patients undergoing colorectal resection for IBD. Approximately 70 to 80% of patients with Crohn's disease and 20 to 30% of patients with ulcerative colitis require surgery during their lifetime.¹⁷ Patients with IBD who require surgery usually have failed multiple medical therapies such as steroids, mesalamine, infliximab and other biologics, azathioprine, and methotrexate, and often have developed complications such as perforation, fulminant colitis, recurrent abscesses, strictures, and enteric fistulae. As such, these patients are at high risk for postoperative complications. For example, one meta-analysis of 12 studies comparing patients with IBD who did or did not receive preoperative infliximab therapy found a significantly increased rate of early postoperative complications in patients in the infliximab group, specifically finding more anastomotic leaks, pouch-related complications, sepsis, and thrombotic events.¹⁸

There have been few studies applying the ERAS pathway to IBD patients, likely due to a concern about placing these complicated patients on a more aggressive "fast track" pathway. One small study of 20 patients with Crohn's disease undergoing laparoscopic ileocecal resection found that compliance with the ERAS pathway was high except for avoidance of intra-abdominal drain placement.¹⁹ Other components (no bowel preparation, no nasogastric tube, early removal of urinary catheter, early oral intake, early mobilization, restrictive fluid management, and opioid-sparing analgesia) had high adherence. Patients on the pathway had earlier return of bowel function and shorter length of stay, with similar rates of postoperative complications. Another small study of 32 patients with Crohn's disease undergoing open ileocolic resection found that a fast-track pathway (including epidural analgesia, early oral intake, and early mobilization) reduced length of stay with no increase in morbidity or readmission rate.²⁰

Pediatric Patients

To date, the majority of studies in support of ERAS pathways have included adult patient populations. It is unclear if these protocols can be translated to pediatric populations, or if

expedited recovery pathways will be similarly embraced by patients, their families, and clinicians. Though some clinicians assume that parents and caregivers would not be amenable to "fast track" pathways, cultural norms and patient expectations may be shifting. Reismann et al demonstrated a 95% patient and parent satisfaction rate among patients younger than 15 years using the ERAS protocol after routine surgery; however, only 36% of the 436 eligible patients completed the protocol.²¹ Another hurdle to applying ERAS pathways to younger patients is determining what age range within the pediatric population is appropriate for certain pathways; for example, an expedited recovery pathway for children and adolescents is unlikely to be applicable to infants.

Several groups have begun to investigate applying ERAS protocols to pediatric populations. A systematic review of five studies of children undergoing gastrointestinal, urologic, and thoracic procedures was performed, but the studies were not well controlled, and at most only 6 of the 20 ERAS interventions were administered.²² Nevertheless, the data suggested that ERAS pathways in children may be correlated with shorter length of stay, less narcotic use, and no difference in complications.

West et al compared 44 children with IBD undergoing colorectal resection with case-matched adult controls.²³ Adult patients were younger than 25 years, with IBD, and followed the ERAS pathway, while pediatric patients received standard of care. They found that, though there was no difference in time to return of bowel function, pediatric patients had significantly longer length of stay, diet advancement, and time to mobilization compared with their adult counterparts. There was no difference in morbidity or rate of readmission. These data suggest that application of an ERAS pathway to the pediatric population may lead to shorter hospital stays and earlier return to daily activities, with associated cost savings, though patient and family expectations may need to be more actively managed.

Though currently published data on ERAS and pediatric populations are limited, more studies are forthcoming. The Johns Hopkins Children's Center has created a modified ERAS pathway that will test in a pilot study of children older than 12 years undergoing colorectal surgery.²⁴ Their protocol includes many aspects of the ERAS adult pathways, including preoperative counseling, carbohydrate loading, antibiotic prophylaxis, fluid management, early oral nutrition, and early mobilization, but excludes components such as avoidance of drain placement due to its lack of applicability to pediatric populations. Now that ERAS pathways for adult patients are becoming widely accepted, it will be of interest to assess the feasibility, safety, and efficacy of these pathways in pediatric patients.

Conclusion

Although there is a surprising paucity of studies on using enhanced recovery pathways in unique patient populations, the available data indicate that ERAS techniques can be safely applied to a wide range of patients and clinical scenarios. Elderly patients, despite their frailty, have been able to

adhere to most aspects of ERAS pathways, and seem to experience similar benefits including shorter length of stay and fewer complications. Select components of the ERAS pathway have been applied to patients undergoing emergent and urgent surgery, with improvement in surgical outcomes as well. However, the studies on patients with specific comorbidities, IBD, and pediatric patients are limited. It is difficult to draw conclusions from the sparse data available, but ERAS does appear to at least be safe in these populations. As more clinicians and hospitals embrace standardized care pathways to optimize perioperative care, it will be critical to fill in the gaps and assess if these unique patient populations experience benefit from enhanced recovery techniques and whether specific adjustments to these pathways should be applied to unique clinical scenarios.

Conflict of Interest

None declared.

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