

Enhanced recovery in intestinal surgery

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Abstract

Enhanced recovery after surgery (ERAS) programmes utilise a multimodal and multidisciplinary approach to surgical care. The aim of ERAS is to reduce the surgical stress response, maintain physiological function and metabolic homeostasis and expedite patients' recovery to their baseline status. With its success in colorectal practice, ERAS is increasingly adopted in other surgical specialities. A good ERAS programme involves integrated pre-operative, intra-operative and post-operative evidence-based practice. Successful ERAS programme translates to a standardized patient care pathway, improved clinical outcomes and shorter hospital stay, all of which will help facilitate the increasing demand on healthcare and bed pressure. Its principles and many components are transferable to other surgical specialities including acute surgical services and medical specialities to improve patient care and recovery and will soon become the standard of care for the majority of hospital inpatients.

Keywords ERAS; fast-track surgery

Enhanced recovery after surgery (ERAS) programmes utilise a multimodal and multidisciplinary approach to surgical care. ERAS programmes involves integrated pre-operative, intra-operative and post-operative evidence-based practice. The aim of ERAS is to reduce the surgical stress response, maintain physiological function and metabolic homeostasis and expedite patients' recovery to their baseline status. The concept of ERAS was first introduced in 1990s in colonic surgery by Henrik Kehlet to reduce post-operative complications and length of hospital stay.¹ ERAS is now widely practice despite the initial apprehension and slow uptake, with studies repeatedly showing that it is safe and shortens hospital stay.² With its success in colorectal practice, ERAS is increasingly adopted in upper GI surgery and pancreatic surgery, as well as in non-GI specialities such as orthopaedics and urology.

Pre-operative preparation

Pre-operative assessment

Once the shared decision has been made to proceed with major surgery, patients should undergo pre-operative assessment to assess fitness for surgery. Nowadays this is done at dedicated pre-operative assessment clinics which are often nurse-led with

the support of consultant anaesthetists for advice and assessment of high-risk patients. The clinic allows assessment of a patient's general fitness, medical comorbidities, drug history and the optimization of pre-existing conditions. Simple investigations such as full blood count and renal function, ECG, CXR, stress test or simple 6-minute walk test can be carried out as required. Nowadays for major resectional surgery, many units carry out objective evaluation of functional capacity with more sophisticated tests such as cardiopulmonary exercise testing (CPET) or myocardial perfusion scanning. This provides a more objective assessment of operative risks to determine a patient's suitability to proceed to surgery and enables the planning for post-operative critical care facility when necessary.³ Good pre-operative planning helps facilitate same-day admission and avoids unnecessary cancellations. It also provides an opportunity for the assessment of social circumstances to aid discharge planning and social risk factors such as smoking and alcohol, which are linked to increased post-operative complications such as bleeding, wound infection and cardiopulmonary dysfunction.

Pre-operative education

Apart from pre-assessment of fitness for surgery, patients in an ERAS programme will also receive pre-operative education with information regarding the surgery, anaesthetic procedures, anticipated post-operative recovery and the journey from admission to discharge. Such pre-operative education helps alleviate anxiety and encourages patients' participation in their recovery process. For bariatric surgery, pre-operative information has been shown to improve patient's compliance and reduce anxiety and stress post-operatively. For patients undergoing in colorectal surgery, pre-operative stoma education is important as it helps mentally and physically prepare the patients in their expectation and management of their stoma and has been shown to reduce hospital stay.

Smoking and alcohol cessation

Smoking is associated with increased risk of post-operative wound sepsis, pulmonary complications and venous thromboembolism. Cessation for at least 4 weeks leading up to surgery should be greatly encouraged as it has been shown to reduce post-operative complications.⁴

Alcohol misusers are also at two- to threefold increased risk of post-operative pulmonary complication, wound infection, wound breakdown and increased length of hospital stay. Abstinence has been shown to improve outcome and should be recommended for at least 4 weeks.⁵

Pre-operative nutrition

The practice of prolonged fasting period is no longer recommended. Patients are allowed solids (6 hours) and clear fluids (2 hours) prior to induction of anaesthesia. Pre-operative fasting will inhibit insulin secretion and promote release of catabolic hormones.

The provision of oral carbohydrate drinks up to 2 hours prior to surgery has been shown to reduce post-operative insulin resistance, reduce protein breakdown, improve muscle strength and shorten hospital stay.

Pre-operative supplementary nutrition should be considered for patients who had unintentional pre-operative weight loss or those who are significantly malnourished. Unintentional weight loss,

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especially loss of muscle mass, is associated an increased risk of post-operative cardiovascular complications, increased length of stay and increased mortality following colorectal surgery.⁶ Pre-operative nutritional support may need to be considered in patients with significant weight loss. Similar consideration should be given to patients with upper GI or hepato-pancreato-biliary malignancy where the disease process often causes malnutrition for mechanical or functional reasons. Dietician input is recommended and in severe cases it may be beneficial to consider a period of enteric or even parenteral feeding if time allows.

Pre-operative mechanical bowel preparation

Mechanical bowel preparation has no impact in reducing anastomotic leak rates or septic complications. It has the potential to cause greater morbidity such as intravascular depletion or electrolyte disturbances, increased length of stay, and is often poorly tolerated by patients.⁵ Mechanical bowel preparation is therefore no longer recommended in colorectal surgery, apart from in specific conditions such as the need for on-table colonoscopy to identify small lesions or bleeding points. Many surgeons continue to use mechanical bowel preparation prior to rectal surgery where the weight of evidence is not as strong.

Thromboprophylaxis

Surgical patients are at increased risks of post-operative venous thromboembolism due to the need for hospitalization, anaesthesia, and a period of immobilization during and following surgery. The risks are greater in the older age group, underlying malignancy, prolonged abdominal or pelvic surgery, and in patients with complications such as sepsis, acute kidney injury, or bleeding with need for blood transfusion.⁷

When undergoing major surgery, patients should have both mechanical and chemical thromboprophylaxis. Patients should be fitted with embolic stockings or pneumatic compression device especially in prolonged surgery and pelvic surgery. Prophylactic dosage of unfractionated or low-molecular-weight heparin should be given to all patients. For patients who are intolerant of heparin, fondaparinux or aspirin could be used as an alternative. For patients who are at higher risk of bleeding, chemical thromboprophylaxis should only be omitted if the risk of bleeding outweighs the risk of thromboembolism. In such cases, it may be necessary to consider insertion of a caval filter.

Thromboprophylaxis is traditionally given whilst patients remain in hospital. The length of stay is however often shorter with ERAS programme leading to suggestion that it should be given for 7–10 days in these patients or extended to 28 days post-operatively in patients with underlying cancer, morbid obesity, or prolonged abdominopelvic surgery.⁵

Intra-operative strategies

Anaesthesia

The use of rapid short-acting anaesthetic agents (e.g. desflurane), short-acting opioids (e.g. remifentanyl) and muscle relaxants have helped to facilitate more rapid awakening and reduce the need for prolonged period of post-operative recovery and monitoring.

The use of regional anaesthesia (e.g. epidural or spinal opioids) is helpful in the management of post-operative pain and the

prevention of post-operative nausea and vomiting (PONV). This may help to reduce patient's stress response and the release of catabolic hormones thereby reducing the incidence of insulin resistance, hyperglycaemia and the consequences of wound and cardiovascular complications.

Antimicrobial prophylaxis

Antibiotic prophylaxis reduces post-operative wound infection by 20–30% following colorectal surgery. Either systemic or oral antibiotic prophylaxis has a positive effect in reducing post-operative wound infection, although the effect of oral antibiotic prophylaxis is inferior to systemic antibiotic prophylaxis. Combined oral and systemic antibiotic prophylaxis on the other hand is more effective than either route on its own. Combination of systemic antibiotic with oral antibiotic prophylaxis reduces surgical wound infections from 12% to 4.5% and more studies are emerging to show good evidence on the benefits of oral antibiotics prophylaxis in reducing surgical wound infections.⁸ Such studies were, however, performed in conjunction with mechanical bowel preparation. In an era where the practice of mechanical bowel preparation is increasingly discouraged, further studies are required to establish the benefit of oral antibiotic prophylaxis without mechanical bowel preparation. Studies on patients undergoing gastrectomy and oesophagectomy where mechanical bowel preparation was not given have shown positive effects in the reduction of infection rates.⁸

Systemic antibiotic prophylaxis is strongly recommended to reduce the risk of surgical site infection. The antibiotics used should have antimicrobial actions against both aerobic and anaerobic pathogens and they should be based on local antibiotic policy and local resistance pattern. Combination of antibiotics is more effective than single-antibiotic regime and should be given within the hour prior to incision, repeated 3 hours later in prolonged cases or in cases where there had been significant intra-operative blood loss. Prolonged use of systemic antibiotics for more than 24–48 hours post-operatively is not required and such practice predisposes to the development of *Clostridium difficile* infection.⁹

Post-operative nausea and vomiting (PONV)

PONV affects 25% of surgical patients, and is associated with delayed commencement of oral intake, recovery of gut function and subsequent hospital discharge. Risk factors for PONV include female gender, non-smokers, those with history of PONV or motion sickness, major abdominal surgery and the use of volatile anaesthetic agents or parenteral opiates.

A multimodal approach combining non-pharmacological and pharmacological techniques to prevent PONV is recommended. Preventative measures include minimizing the usage of opiates and volatile anaesthetic agents, minimizing pre-operative fasting, the practice of carbohydrate loading and improved hydration in patients prior to surgery.

There are four main pharmacological subtypes of antiemetics – cholinergic, dopaminergic, serotonergic and histaminergic. Two or more antiemetics of different subtypes should be used in combination to improve the potency of the antiemetic effect. Dexamethasone has been shown to have a positive effect in the prevention or management of PONV, although its use should be cautioned in diabetic patients, elderly patients and patients with

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