

# Evidence based medicine underpinning the ERAS protocol in elective colorectal patients: A mini review

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## Article Info

### Article Notes

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### Keywords

ERAS  
Colorectal Surgery  
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## Abstract

**Introduction:** The enhanced recovery after surgery (ERAS) protocol is a set of international guidelines developed with the purpose of decreasing the hospital stay of a patient undergoing elective colorectal surgery. The ERAS protocol outlines a variety of measures that should be taken throughout a patients' surgical stay, including at the first meeting in the preoperative phase, perioperatively and postoperatively.

**Methods:** PubMed database was accessed with the aim of finding relevant material on the subject of the ERAS protocol and colorectal surgery, and the outcomes for patients pre and post implementation of the ERAS protocol. The keywords chosen included ERAS protocol, implementation and colorectal surgery. Filters included access to full free text, available in English, published in the last 5 years and included clinical trials, meta-analysis, randomised controlled trials and systematic reviews. This returned 32 results of which 9 articles were included. These nine articles were reviewed and the outcomes pre and post implementation of the ERAS protocol were examined.

**Results:** The opinion of all the articles reviewed recommend implementation of the ERAS protocol. Each site reported improvements in various factors from length of stay, to post op complications and patient satisfaction. Implementation of ERAS protocols in elective colorectal surgery is associated with improved outcomes.

**Conclusion:** The ERAS protocol is a highly effective protocol for patients undergoing elective colorectal surgery. It has proven benefit in terms of decreased postoperative complications, and reduced length of hospital stay. The ERAS protocol has been successfully implemented in a variety of hospitals around the world with great effect. Future research should focus on the implementation of the protocol on other patient demographics, such as patients undergoing emergency colorectal surgery to explore its benefits in such situations.

## Introduction

The enhanced recovery after surgery (ERAS) protocol is a set of international guidelines established to expedite patients' discharge after colorectal surgery. This protocol was first developed in 1997. The ERAS protocol outlines a variety of measures that should be taken throughout all stages of patients' surgical stay, including the preoperative phase, perioperatively and postoperatively<sup>1</sup>. The aim of the protocol is to prevent postoperative complications by utilising evidence-based strategies, and ensuring early detection and intervention when complications arise. Postoperative ileus for example has been suggested to be reduced by early feeding, mechanical bowel prep, early mobilisation and laparoscopic surgery<sup>2</sup>. By preventing complications, and identifying early

any complications that do arise, patients after elective colorectal surgery should be able to resume normal activity at an earlier stage, allowing them to be discharged earlier, and reduce morbidity and mortality. Some of the common complications targeted include postoperative nausea and vomiting, deep-vein thrombosis, postoperative ileus and postoperative pain. The ERAS protocol promotes a standardisation of care with evidence based practices and promotes a multidisciplinary approach to the management of these surgical patients<sup>3</sup>. As a result of the growing body of evidence in support of the ERAS protocol, it is becoming accepted as the gold standard of care for patients undergoing elective colorectal surgery.

### Background and rationale for conducting the literature review

Colorectal surgery is common and is performed for a variety of medical conditions, such as colorectal cancer, Crohn's disease, ulcerative colitis and polyps<sup>4</sup>. In the United States, there are over 600,000 colorectal operations occurring per year<sup>4</sup>. The generic patient who undergoes elective colorectal surgery is often elderly, being over the age of 65, with numerous comorbidities<sup>4</sup>. Elective colorectal surgery can be extensive, and patients undergoing such operations can suffer from a variety of complications, intraoperatively and postoperatively<sup>5</sup>. Such complications include, but are not limited to surgical site infection, bowel perforation, stoma formation, postoperative ileus, atelectasis, anastomotic leak, deep-vein thrombosis and pulmonary embolus<sup>5</sup>. As a result of the nature of the surgery and the possible complications, patients undergoing elective colorectal surgery occupy many bed days in hospitals, with a median length of stay (LOS) reported of 14 days<sup>6</sup>. As a result of the number of such surgeries occurring annually, with such a long LOS, it is important to research methods to reduce these complications and promote early discharge from hospital. The benefits of doing so are both financial to the patient and hospital, but also psychological to the patient, with greater patient satisfaction.

The ERAS protocol is a large set of guidelines and requires the collaboration of a variety of members in the hospital setting. The protocol can be broken down into numerous compartments that occur at different times in the patient journey. Preoperative measures begin before surgery, usually during the first encounter of the healthcare provider to the patient. Beneficial aspects supported by the ERAS protocol include a dedicated preoperative assessment clinic. During this clinic, the healthcare provider has an opportunity to optimise the patient before surgery. They will be reviewed by the surgical and anaesthesiology departments, which provides an opportunity to perform any necessary investigations such as blood tests, radiological imaging such as chest x-rays, cardiology tests such as echocardiogram, and pulmonary function tests for patients

with respiratory issues. Patients can also be referred to other healthcare providers, for preoperative optimisation of their chronic, or newly diagnosed conditions. Medication lists can be reviewed, and instructions given to the patients regarding which medications to continue taking before surgery, and what medications need to be stopped and held preoperatively. During these clinics, patient education is delivered by the multidisciplinary team, regarding numerous issues such as fasting times, what to expect on the morning of surgery, expected length of stay, the care that will be delivered on the ward such as physiotherapy and stoma care, and provides an opportunity for patients to ask questions. A nutritional assessment is often carried out by a dietitian, and preoperative carbohydrate drinks provided to be taken on the morning of surgery which reduces postoperative dehydration, insulin resistance and hyperglycaemia<sup>7</sup>.

Perioperatively, there are numerous important elements of the protocol to perform. Preoperative antibiotics should be given 30 minutes before skin incision to reach therapeutic levels in the tissue<sup>8</sup>. Laparoscopic surgery is preferred to open surgery due to a smaller wound, decreased blood loss and postoperative pain<sup>9</sup>. PONV prophylaxis is important, usually by multiple modalities, with granisetron gaining increased popularity due to its once a day dosing versus ondansetron<sup>10</sup>. Nerve blocks, such as a rectus sheath, transversus abdominis plane block or epidural catheters can be useful to provide both intraoperative and postoperative analgesia. They also have the added benefit of reducing the need for opioids with their undesirable side-effects such as delirium, nausea and constipation. Goal directed fluid therapy has been a subject supported by the ERAS protocol, with a tendency to lean towards fluid restrictive instead of fluid liberal policies to prevent overloading patients<sup>11</sup>. Balanced salt solutions such as compound sodium lactate are preferable in the majority of patients instead of normal saline, due to the decreased risk of hyperchloremic metabolic acidosis, with the exception being in a small subgroup of hyponatraemic patients<sup>12</sup>. Intraoperative warming should be utilised, and has been associated with decreased LOS<sup>11</sup>. Nasogastric tubes should not be routinely placed for elective colorectal surgery, and where inserted, should be removed at the end of the case, and not left in-situ.

Postoperatively, there are numerous elements of the ERAS protocol to consider. Early mobilisation is a key factor of the protocol. This is usually achieved in collaboration with physiotherapists, but also nursing staff and health care assistants, and highlights the multidisciplinary approach to the protocol. Early mobilisation promotes muscle mass thereby preventing myopathy, promotes bowel function decreasing the incidence of postoperative ileus, is a form of respiratory physiotherapy preventing atelectasis and lung

infections, and finally decreases the formation of deep-vein thrombosis and pulmonary embolism<sup>13</sup>. Mobilisation can be aided from the surgical perspective by using minimally invasive surgical approaches, such as laparoscopic surgery. Anaesthesiologists can aid mobilisation by enhancing postoperative analgesia. Oral analgesia can often be preferred to patient-controlled analgesia, as it means the patient is not attached to a machine for large periods of the day, along with utilising nerve blocks intraoperatively. Patients should be encouraged to resume enteral intake early to promote bowel function and prevent ileus<sup>14</sup>. This can be performed in steps starting with clear fluids, jelly and ice cream, chewing gum and carbohydrate drinks, before progressing to solid food. The early removal of catheters has the dual benefit of aiding mobility and decreasing the risk of urinary tract infection, and has been associated with a decreased LOS<sup>11</sup>. Prophylactic anticoagulation for deep-vein thrombosis is important and is usually provided in a hospital setting by low-molecular weight heparin, which can be started on the same day as surgery, usually at least 4 hours postoperatively<sup>15</sup>.

These protocols aid with early return to eating and drinking, which reduces complications such as postoperative ileus, small bowel obstruction and its sequelae of nasogastric tube insertion, potential for further surgery, parenteral nutrition and lengthened hospital stay. These are a wide set of recommendations to be incorporated that require the collaboration of surgeons, anaesthesiologists, nursing staff, physiotherapists and dieticians among others to perform. This multidisciplinary team approach has more benefits than those described in the ERAS studies as MDT approaches to patient care are being explored currently in a number of fields. The British Journal of Anaesthesia suggests the implementation of the ERAS protocol in more clinical settings can show the benefit of MDT input<sup>16</sup>.

### State the primary objective of the review article

The primary objective of this article is to assess the evidence and benefits of the ERAS protocol being implemented in hospitals for patients undergoing elective colorectal surgery, and assess the results of its implementation. These benefits include but are not limited to; reduced postoperative complications including postoperative pain, nausea and vomiting, postoperative ileus and bowel obstruction. These reductions in complications may affect the length of stay, morbidity and mortality of patients.

### Methods

PubMed database was accessed on the 8<sup>th</sup> – 10<sup>th</sup> of October 2024, with the aim of finding relevant material on the subject of ERAS protocol and colorectal surgery and the outcomes for patients pre and post implementation of ERAS

protocol. The keywords chosen include ERAS protocol, implementation and colorectal surgery. Filters included access to full free text, available in English, published in the last 5 years and included clinical trials, meta-analysis, randomised controlled trials and systematic reviews. This returned 32 results. These results had their title and abstract reviewed against the inclusion criteria being colorectal surgery and ERAS protocol. In total, 9 articles met the inclusion criteria, and had their full text read to ensure they were appropriate to be included in this mini review. Exclusion criteria included articles not being based on a population of colorectal patients and not having ERAS as a major theme of the paper. Papers discussing ERAS in other patient populations such as in gynaecology were excluded. These 9 articles were reviewed and the outcomes pre and post implementation of the ERAS protocol were examined. These results are discussed below. There was a general consensus from all the papers that outcomes were improved post introduction of these gold standards of care.

### Results

The opinion of all the articles reviewed recommend the implementation of the ERAS protocol. The implementation of the ERAS protocol in major colorectal surgery is associated with improved outcomes, such as a reduced hospital stay which was supported by 5 papers<sup>17-21</sup>. LOS can decrease from 7.7 days pre-ERAS to 5.5 days post implementation of the ERAS protocol<sup>18</sup>. This reduced LOS can have a significant impact in terms of financial savings for the healthcare provider, provide greater patient satisfaction, and decrease the demand on inpatient beds. Factors that have been shown to be associated with increased LOS include open surgery, stoma formation, COPD and raised creatinine with statistical significance<sup>17,22</sup>. Acute kidney injury (AKI) has also been associated with a prolonged LOS<sup>18</sup>. Specific factors associated with a decreased LOS include intraoperative warming, early cessation of intravenous fluids, and early removal of catheters and NG tubes<sup>23</sup>.

Implementation of the ERAS protocol can lead to lower rates of postoperative complications as supported by the literature, with rates of complications reducing from 56% pre-ERAS to 9.4% post-ERAS<sup>20,27</sup>. Patients with lower LOS had lower readmission rates, whereas those with an increased LOS had higher readmission rates<sup>19,21</sup>. Prolonged postoperative ileus can occur in 16.6% of patients who undergo elective colorectal surgery, but this has shown to be reduced in patients who undergo early feeding, mechanical bowel preparation, early mobilisation and laparoscopic surgery<sup>30</sup>. In such patients, LOS can decrease to 9.5 days from 13 days when a prolonged postoperative ileus is avoided<sup>28</sup>. Implementation of the ERAS protocol can reduce the time from bowel function to 2.5 days from 4.1 days<sup>30</sup>.

The greater a hospital network complies with the ERAS protocol, the greater the benefits in terms of decreased LOS and postoperative complications<sup>19,20,21,27</sup>. As ERAS protocols become more established in an institution, open surgery is used less frequently<sup>19</sup>. Other factors that changed include the increased usage of intraoperative non-opioid infusions such as lidocaine, increased postoperative prescribing of non-opioid analgesia such as NSAIDs and gabapentin<sup>19</sup>. Catheter durations also decrease from 2.1 days to 1.4 days with importantly, no change in reinsertion rates<sup>19</sup>.

The ERAS protocol has been shown through a variety of research to enhance early discharge whilst not increasing 30-day readmission rates<sup>8-14</sup>. It has been suggested that the 30-day readmission rates decrease from 19% pre-ERAS to 12% post ERAS<sup>12</sup>. These findings were of particular note in patients who underwent ileostomy formation, as this was an independent risk factor for readmission. Readmission rates for such procedures can decrease by up to 50% which is significant<sup>21</sup>. Other factors associated with readmissions include patients living in close proximity to the hospital, and patients who had lengthy inpatient stays<sup>21</sup>.

The ERAS protocol facilitates faster recovery of bowel function, mobilization, and oral intake<sup>25</sup>. Optimized perioperative management should be mandatory for elective surgery today as it enhances postoperative patient recovery, reduces morbidity and infectious complications<sup>26</sup>.

## Discussion

One key theme from these papers includes the implementation of ERAS protocol leading to better outcomes. The key points discovered in this research are introduction of the ERAS protocol into a facility or department leads to shorter length of stay from 8.5 to 7.5 days<sup>31</sup>, no change or a decrease in surgical complications and does not lead to any increase in readmission rates. The ERAS protocol has been so highly successful that it is now being introduced in many other surgical fields as indicated in the above literature review including paediatric surgery, gynaecology and thoracic surgery<sup>32</sup>. It has become widely recognised that there is now a dedicated website and gynaecological specific guidelines with regards to the ERAS protocol<sup>33</sup>. These findings suggest that the vast majority of elective colorectal patients should be following the ERAS protocol, given the benefits of reduced length of stay and a potential decrease in complication rates. It is a versatile protocol, now being adapted in gynaecological surgeries with similar benefits<sup>34</sup>. There is potential for further research options to investigate if implementation of this protocol would benefit patients in other surgical specialities such as neurosurgery. Ideas for future research around the topic of ERAS protocol may surround preoperative bowel prep. It is suggested by the ERAS protocol to be omitted, but some research may suggest its use in clinical practice<sup>35</sup>.

More research on preoperative bowel prep may be required to address this topic and its possible incorporation into the ERAS protocol.

## Conclusion

The ERAS protocol is a highly successful protocol for patients undergoing elective colorectal surgery. The ERAS protocol has a strong evidence base to suggest a benefit to patients with respect to decreased postoperative complications, decreased morbidity, mortality, and length of stay in patients undergoing elective colorectal surgery<sup>29</sup>. The ERAS protocol has been successfully implemented in a variety of hospitals internationally with great effect<sup>29</sup>. Studies have shown that the stricter a hospital adheres to the ERAS protocol, the greater the benefits in terms of decreased LOS and postoperative complications. Areas for continued research include the implementation of this protocol in a variety of different surgical populations, such as emergency colorectal surgery, or non-colorectal surgery.

## Declaration

No conflict of interests to declare.

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