



# Enhanced Recovery After Surgery (ERAS) Programs for Patients Undergoing Colorectal Surgery

August 2017

## Prepared for:

Department of Veterans Affairs  
Veterans Health Administration  
Quality Enhancement Research Initiative  
Health Services Research & Development Service  
Washington, DC 20420

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## PREFACE

The VA Evidence-based Synthesis Program (ESP) was established in 2007 to provide timely and accurate syntheses of targeted healthcare topics of particular importance to clinicians, managers, and policymakers as they work to improve the health and healthcare of Veterans. QUERI provides funding for four ESP Centers, and each Center has an active University affiliation. Center Directors are recognized leaders in the field of evidence synthesis with close ties to the AHRQ Evidence-based Practice Centers. The ESP is governed by a Steering Committee comprised of participants from VHA Policy, Program, and Operations Offices, VISN leadership, field-based investigators, and others as designated appropriate by QUERI/HSR&D.

The ESP Centers generate evidence syntheses on important clinical practice topics. These reports help:

- Develop clinical policies informed by evidence;
- Implement effective services to improve patient outcomes and to support VA clinical practice guidelines and performance measures; and
- Set the direction for future research to address gaps in clinical knowledge.

The ESP disseminates these reports throughout VA and in the published literature; some evidence syntheses have informed the clinical guidelines of large professional organizations.

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Comments on this evidence report are welcome and can be sent to Nicole Floyd, ESP CC Program Manager, at [Nicole.Floyd@va.gov](mailto:Nicole.Floyd@va.gov).

**Recommended citation:** Greer N, Sultan S, Shaukat A, Dahm P, Lee A, MacDonald R, McKenzie L, Ercan-Fang D, Wilt, TJ. Enhanced Recovery After Surgery (ERAS) Programs for Patients Undergoing Colorectal Surgery. VA ESP Project #09-009; 2017.

This report is based on research conducted by the Evidence-based Synthesis Program (ESP) Center located at the **Minneapolis VA Health Care System, Minneapolis, MN**, funded by the Department of Veterans Affairs, Veterans Health Administration, Office of Research and Development, Quality Enhancement Research Initiative. The findings and conclusions in this document are those of the author(s) who are responsible for its contents; the findings and conclusions do not necessarily represent the views of the Department of Veterans Affairs or the United States government. Therefore, no statement in this article should be construed as an official position of the Department of Veterans Affairs. No investigators have any affiliations or financial involvement (eg, employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties) that conflict with material presented in the report.

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## EXECUTIVE SUMMARY

### INTRODUCTION

Enhanced recovery after surgery (ERAS), also referred to as an enhanced recovery program, fast-track rehabilitation, multimodal management, or similar descriptors, is a multidisciplinary approach to perioperative care. A protocol of components related to preadmission, preoperative, intraoperative, and postoperative care is implemented with the goal of improving patient recovery, facilitating earlier discharge from the hospital, and potentially reducing health care costs without increasing complications or hospital readmissions. The protocol components may contribute to minimizing, and/or improving the response to, physiological stress associated with surgery.

Although guidelines for ERAS related to colorectal surgery exist, variation in the number and definition of protocol components contributes to difficulties in determining effectiveness. Little is known about implementation barriers and facilitators as well as components (or combinations of components) key for improved clinical outcomes. In addition, protocol compliance, when reported, may be measured by percentage of elements applied or completed without standardization across elements (timing, regimens, doses, *etc.*).

Preliminary literature searches conducted for topic refinement found several systematic reviews on enhanced recovery for colorectal surgery. However, none reported on subgroups based on surgical approach (open or laparoscopic surgery) or colorectal condition. While several noted the enhanced recovery protocol components from the included studies, the standard care protocols were not documented. None commented on barriers or facilitators to implementation of an enhanced recovery program.

The defining components of an enhanced recovery program for colorectal surgery have been revised over time and new trials have been published since the search dates of the existing reviews. We provide an updated review of randomized controlled trials (RCTs) and controlled clinical trials (CCTs) looking at comparative effectiveness and harms overall and by type of surgery, colorectal condition, and fidelity to an enhanced recovery protocol. We also review barriers and facilitators to implementation and provide a contextual discussion of compliance and outcomes.

With input from the topic nominator and a technical expert panel, we developed the following key questions:

KQ1: What is the comparative effectiveness of ERAS versus usual care or a subset of ERAS components for adults undergoing elective colorectal surgery?

KQ2: What are the harms of ERAS versus usual care or a subset of ERAS components for adults undergoing elective colorectal surgery?

KQ3: Do comparative effectiveness and harms vary by fidelity to ERAS components?

KQ4: Do comparative effectiveness and harms vary by type of, and clinical conditions for, colorectal surgery (*eg*, anatomical site, laparoscopic versus open surgery, reasons for open surgery, *etc*)?

KQ5: What are the barriers to and facilitators of implementation of ERAS programs?

## METHODS

### Data Sources and Searches

We searched MEDLINE (Ovid) and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) for English language publications from 2011 to July 2017. Search terms included terms used synonymously with ERAS (*eg*, fast track, multimodal, accelerated, enhanced) and terms for colorectal surgery (both open and laparoscopic). We also obtained articles from reference lists of existing systematic reviews, reference lists of included studies, and suggestions from technical expert panel members.

### Study Selection

Abstracts identified in the literature searches were independently reviewed by 2 researchers. Full-text review of potentially eligible studies was completed by one researcher with input from co-investigators. We included:

- 1) Studies of adults undergoing elective colorectal surgery (any colorectal procedure, open or laparoscopic surgery),
- 2) For effectiveness of ERAS programs (KQ1-KQ4):
  - a. randomized controlled trial (RCT) or controlled clinical trial (CCT)
  - b. comparator is usual care or subset of ERAS components (as defined by study authors),
- 3) For barriers to and facilitators of implementation (KQ5):
  - a. any study design providing qualitative data on barriers and facilitators
  - b. study conducted in healthcare system relevant to VA.

We excluded:

- 1) Non-English language publications,
- 2) Studies that compared laparoscopic and open surgery within an enhanced recovery protocol,
- 3) Studies reporting outcomes before and after implementation of an enhanced recovery protocol (*ie*, pre-post or case series with historical controls design); we included controlled clinical trials if data collection was concurrent,
- 4) Trials of single a component of enhanced recovery,
- 5) Studies that included post-operative components only (often referred to as “Post-operative Rehabilitation” or “Controlled Rehabilitation”).

### Data Abstraction and Quality Assessment

For each eligible study for KQ1 to KQ4, we created a table indicating the included ERAS components and the ERAS components implemented as part of the usual care protocol.

We abstracted the following data onto evidence tables organized by type of surgery (open or laparoscopic):

1) Patient and study characteristics: study location (country); funding source; inclusion/exclusion criteria; length of follow-up; compliance with enhanced recovery protocol; patient age, gender, race/ethnicity, BMI or obesity status; comorbidity status; colorectal conditions; and surgical procedures

2) Outcomes (as defined above) for intervention and control groups.

Risk of bias of RCTs and CCTs was assessed using a modified Cochrane approach considering sequence generation, allocation, blinding, incomplete outcome reporting, and selective outcome reporting. Each study was rated as high, medium, low, or unclear risk of bias.

## Data Synthesis and Analysis

Tables were developed with studies pertaining to KQ1 and KQ2 noting outcomes reported by fidelity to enhanced recovery components (KQ3) or type of surgery (KQ4). If applicable, data for critical outcomes were pooled. We qualitatively summarized findings for KQ5 (enhanced recovery barriers and facilitators).

We evaluated the overall strength of evidence for our critical outcomes using a method developed by the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) group.

## RESULTS

### Results of Literature Search

We reviewed 1789 citations and excluded 1629 studies at the abstract stage and another 117 after full-text review. Many of the excluded studies were observational studies that provided contextual information about adherence or compliance but did not meet inclusion criteria. We added 7 articles (including 6 trials published prior to 2011 identified from existing systematic reviews), resulting in a total of 50 included articles: 25 trials reported in 27 articles, 10 with information about implementation barriers and facilitators, and 13 systematic reviews.

### Summary of Results for Key Questions

Thirteen RCTs compared open elective colorectal surgery with an enhanced recovery protocol to open surgery with a usual care protocol. Eight studies (6 RCTs and 2 CCTs) compared an enhanced recovery protocol to usual care in patients undergoing laparoscopic surgery. Three studies (2 RCTs and 1 CCT) included 4 groups of patients providing comparisons of enhanced recovery and usual care for both open and laparoscopic surgery. One RCT included both open and laparoscopic surgery with the surgeon deciding the surgical approach. None of the studies was conducted in the US. Indications for surgery included cancer and non-cancer conditions.

#### *Key Question 1*

Length of stay and overall perioperative morbidity were reduced in the enhanced recovery protocol groups compared to the usual care protocol groups. In pooled analyses, the mean reduction in length of stay was 2.59 days (95% CI -3.22, -1.97) and the risk ratio for experiencing complications was 0.66 (95% CI 0.54, 0.80). All-cause mortality was infrequent and did not differ significantly between the enhanced recovery and usual care protocol groups.

Readmissions, typically reported to 30 days post-surgery, were also similar (pooled risk ratio 1.11 (95% CI 0.82, 1.50)). The incidence of ileus was not significantly different between enhanced recovery and usual care protocol groups, while gastrointestinal function (time to flatus and/or first bowel movement and time to oral intake of solid foods) were significantly shorter following surgery with an enhanced recovery protocol compared to a usual care protocol. Pain and quality of life were infrequently reported.

### *Key Question 2*

Surgical site infection rates did not differ significantly between protocol groups. The pooled risk ratio was 0.75 (95% CI 0.52, 1.07). Other harms, including bleeding events, anastomotic leakage, need for re-operation, urinary tract infection, and cardiovascular complications also did not differ between groups.

### *Key Question 3*

Few studies reported adherence to the enhanced recovery protocol components. We identified 11 studies that best differentiated the enhanced recovery protocol from the usual care protocol. We found pooled length of stay and overall morbidity in those studies, and in the remaining studies (*ie*, those with less differentiation of protocols), to be similar to the overall pooled estimates.

### *Key Question 4*

For critical outcomes (length of stay, all-cause mortality, overall morbidity, readmissions, and surgical site infections) we found no difference between enhanced recovery and usual care protocols in studies performing open surgery or studies performing laparoscopic surgery or for studies of different colorectal conditions. We did not find outcomes reported for other subgroups of interest: comorbidity status, mobility status, frailty index, age, patient size, or right- versus left-side surgery.

### *Key Question 5*

We included findings from interviews with providers and patients. Staffing and organizational barriers included difficulty adapting to change, need for flexibility to address individual patient needs, disagreement with the protocol recommendations, scheduling, and lack of resources to implement the protocol components. Facilitators included good communication and relationships across departments, leadership, integration of enhanced recovery protocols into order sets and computer order entry systems, audit and feedback with reporting of program data, and staff education. Patient-related barriers include characteristics of the population (*eg*, comorbidities, social support, health literacy) and concerns about care following discharge. Facilitators include patient education, early communication, and patient appreciation of early mobilization and hospital discharge.

## **DISCUSSION**

### **Key Findings and Quality of Evidence**

1) Enhanced recovery protocols significantly reduced length of stay (mean reduction 2.6 days) following colorectal surgery compared to usual care protocols (Quality of Evidence: Moderate). Length of stay reductions occurred across surgical approach (open and laparoscopic) as well as

clinical indication (*ie*, colorectal cancer, rectal cancer, a mix of colorectal cancer and benign conditions, or benign conditions alone).

- 2) Enhanced recovery protocols significantly reduced overall perioperative morbidity (mean absolute reduction 10%) associated with colorectal surgery compared to usual care protocols (Quality of Evidence: Moderate). Reductions due to enhanced recovery protocols did not significantly vary by type of, or clinical condition for, surgery.
- 3) Mortality, hospital readmissions, and surgical site infections were similar following colorectal surgery with an enhanced recovery protocol or a usual care protocol (Quality of Evidence for Mortality: Low) (Quality of Evidence for Readmissions: Low) (Quality of Evidence for Surgical Site Infections: Low). Outcomes were similar across surgical approach and clinical indication for surgery.
- 4) Few studies reported on clinically meaningful differences in pain or quality of life, though most studies noted an improvement in gastrointestinal function (typically passing flatus or bowel movement).
- 5) Enhanced recovery protocols varied across studies, little information was provided regarding component compliance, and evidence is insufficient regarding key components.
- 6) Commonly reported barriers to implementation include time, resources, and acceptability/feasibility of protocols to clinical staff and patients. Facilitators include organizational support, sufficient staff and electronic medical record resources, clear communication that is receptive to staff/patient feedback, and standardized yet adaptable and feasible protocols.

### **Implications for Practice**

Few of the studies included in our review addressed compliance with the enhanced recovery protocols and only one related compliance to critical outcomes. Although representative data from observational studies (*not systematically reviewed*) suggest that outcomes vary depending on protocol compliance, there is no consensus on key components or a “bundle” of components necessary to achieve improved patient outcomes.

### **Limitations**

Many studies were rated high or unclear risk of bias as methods of sequence generation, allocation concealment, and blinding were often not reported. Observed differences in outcomes across studies might be due to implementation of different enhanced recovery protocols, implementation of enhanced recovery in different healthcare systems and with different procedures (including discharge protocols), different patient populations (*eg*, exclusion of patients with ASA grades III or IV), and different outcome definitions.

### **Applicability of Findings to the VA Population**

None of the trials and only 2 of the qualitative studies of barriers to and facilitators of implementation were done in the US. There is no direct evidence of the effectiveness or harms of an enhanced recovery protocol for colorectal surgery in the US or at VHA facilities. Hospital

length of stay, readmissions, and surgical complication rates from reported studies may not reflect US settings including those at VHA facilities. Although there are real potential benefits of enhanced recovery programs, particularly in reduced length of stay and possibly morbidity, rolling out a new protocol in “total quality improvement” fashion with evaluation and refinement might be the best approach due to limited applicability of existing RCT data, rapidly evolving standard practice, limited full understanding of implementation/adherence/standardization of enhanced recovery components, and possible barriers.

### Research Gaps/Future Research

There is a need for data from the US, and, for the purpose of making decisions relevant to Veteran care, RCTs or quality improvement program processes with real-time evaluation across varying VHA facilities. While we found no empiric evidence, our key content experts and consultants suggest that many of the enhanced recovery components have been or over time are being adopted into standard perioperative care for colorectal surgery.

Studies designed to evaluate the benefits and harms of enhanced recovery protocols should provide detailed information describing enhanced recovery components, and specifically how they are implemented and compliance is assessed in the intervention and control groups. Surgeon experience and surgical volume should be considered. Outcomes should include patient and/or caregiver experiences.

### Conclusions

Implementation of enhanced recovery protocols for elective colorectal surgery resulted in reduced length of stay and overall perioperative morbidity versus standard care protocols. Mortality, readmissions, and surgical site infections were similar between the groups. However, the enhanced recovery and standard care protocols varied across studies in number of components and combinations of components, with few trials reporting compliance with the protocols. There is no reliable evidence on enhanced recovery components, alone or in combination, that are key to improving patient outcomes. The value of investing time and resources into implementing all of the enhanced recovery components remains largely unknown.

## ABBREVIATIONS TABLE

CCT	Controlled clinical trial
ERAS	Enhanced Recovery After Surgery
ERP	Enhanced Recovery Program
FT	Fast Track
RCT	Randomized controlled trial
UK	United Kingdom
US	United States
VA	Department of Veterans Affairs
VHA	Veterans Health Administration